THE PROVEN DETAILS FOR A DURABLE HOME p.56

Fine Homebuilding

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Refinish worn wood flooring

Our guide to today's best exterior trim

Avoid common gutter blunders

Tips for fast, efficient interior trimwork

A new look for a classic Cape

Build a custom outdoor shower

A pro's step-by-step process for restoring wood floors
p. 40

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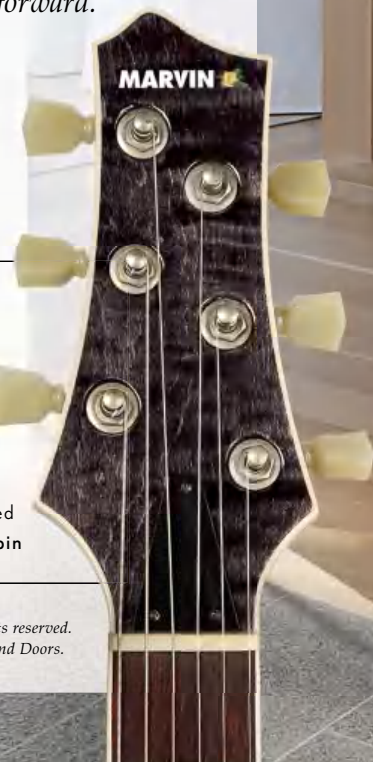

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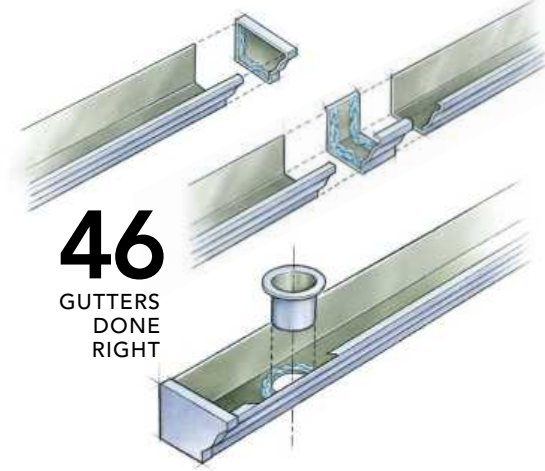

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GUTTERS DONE RIGHT

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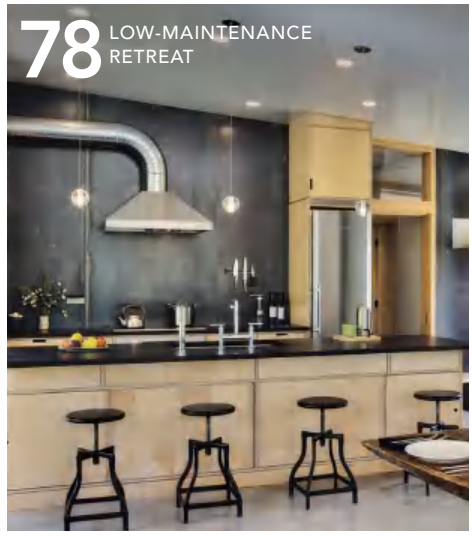

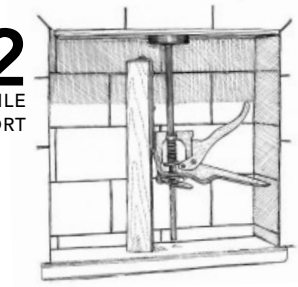

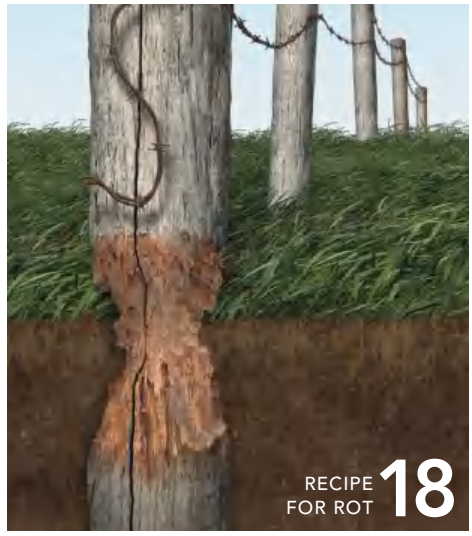

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ON THE COVER: A member of Brett Kelosky's crew uses a T-bar applicator to put the final coat of polyurethane over a refurbished oak floor. See pp. 40-45 for Kelosky's step-by-step method of refinishing wood flooring. Photo by Justin Fink.

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SLIDE SHOW: The best advice on installing crown molding

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breaktime

VISIT our online discussion group to ask a question about any aspect of home building. It's free to sign up at forums.FineHomebuilding.com.

Fogged windows

LEVASSEP ASKS: I'm thinking about drilling small holes in some double-pane windows to remove fog and then installing valves that permit the evacuation of future humidity. How does that technique compare with installing new glass? I'm in northeastern Canada, where very low temperatures are common in winter. Does this technique provide an equivalent R-value to sealed glass?

DanH replies: It can work if the glass is of the right type, if it's done properly, and if you live in a climate where it makes sense. The R-value of the glass should be mostly unaffected. Most of the insulation value of double-pane glass comes from the thin layer of gas between the two glass layers. Argon works well, but plain old air is nearly as good. And by the time the window has fogged, most of the argon has leaked out. One downside to this is that if the windows also have a low-e coating on the inside, that coating may turn from clear to a sort of metallic color as moisture gets to it, which is hard to distinguish from fogging.

Noncoastal Canada is an ideal location for the drilling technique, since the outside air is reasonably dry in the cooler months. The theory behind drilling is that you open up a slight leak to the dry outside air. As the air in the window expands and contracts from temperature changes, any moist air in the window is exchanged with dry outside air. The rate of air exchange is slow, assuming the hole isn't big enough to affect the insulating nature of the glass, but it is still faster than the moist-air leakage from inside the house.

junkhound adds: Unless the fog developed very recently, the glass has actually been etched by an enzyme reaction. Drilling the hole does let the window vent, and the etching will be less apparent without any condensation. I have done a few windows like that until getting around to replacing the glass.

Photos: top, Patrick McCombe; bottom, Rob Yagid

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contributors

THE VOICES OF EXPERIENCE

At the age of 17, BRENT KELOSKY ("Refinish Your Wood Floors," pp. 40-45) joined the family flooring business. Since then, he has worked his way through every position within the company, from sander, installer, trainer, salesperson, and manager, to his current role as vice president. Brent is an active member of the National Wood Flooring Association (NWFA) and holds a Craftsman degree for his involvement and continued training through the NWFA.

After more than a decade in Montana, BRIAN HAMOR ("A New Face for an Old Cape," pp. 50-55) moved to Stowe, Vt., where he opened Hamor Architecture Associates in 2012 with a primary focus on residential design. Brian's designs are influenced by Montana's agrarian architecture, and the ethos of his practice is that good design can enhance the way people live. He has found that a combination of simple, refined details meets a growing need among his clients.

BRIAN PONTOLILO's name has appeared in eight different positions on our masthead in his 13 years at *Fine Homebuilding*, but this is the first time he has written about his own remodeling project. Despite having replaced his chimney, roof, siding, windows, and doors, it's his new outdoor shower that has added the most value to his life (pp. 66-67). Brian left *FHB* in May to pursue new things, but he's still part of our team as a consulting editor.

JAY CRANDELL is an engineer and consultant with experience in structural design, energy efficiency, durability, disaster resistance, and new building technologies. JAMIE LYONS has been researching, analyzing, and designing building systems to make houses work better since the mid-1990s. Jay and Jamie are co-authors of HUD's *Durability by Design* (2002) and its forthcoming revision. Their article "Designing for Durability" is on pp. 56-60.

write an article

Fine Homebuilding welcomes articles from our readers. We'll acknowledge all proposals and return any we can't use, and we'll pay for any articles we publish. For details, check our website at FineHomebuilding.com.

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letters

READER FEEDBACK

IN THE SPOTLIGHT

Air-sealing can lights from below

As a longtime subscriber to *Fine Homebuilding*, I've enjoyed the many articles on making our homes more comfortable and energy efficient. You have recently run many articles on air-sealing can lights. I must be missing something, but there is a surprisingly simple way to correct old ventilated cans. For the last 10 years, I have replaced Juno and Halo vented cans with their airtight varieties, which can be done from the room side rather than from above, and without any demolition.

Here is my simple process: Turn off the electricity to the fixture, and remove the three screws inside the existing can that hold it to its mounting bracket. Pull the can into the room. Reach into the ceiling, remove the plate from the junction box, and disconnect the can's wires. Release the electrical connector on the conduit. Take a new airtight fixture, and remove its three mounting screws and the conduit from the junction box. Now it's simply a matter of rewiring the new fixture and mounting it securely in the old fixture's bracket. Most airtight cans come with a ceiling gasket, but you also can seal the interface between can and ceiling with caulk.

I have probably done about 200 of these changes over the years. It usually takes only 10 to 15 minutes per can.

—MICHAEL BUGG
via e-mail

Author Larry Armanda replies: Thank you, Michael, for your comments. It's clear that you understand the importance of air-sealing these types of fixtures not only to prevent air leakage but also to prevent moisture from accumulating in attic spaces.

The research I did for my article "Air-sealing Can Lights Safely" (*FHB* #249) involved testing the air-sealing methods commonly used by weatherization crews and homeowners (drawing left). Utility and weatherization programs generally don't allow their weatherization workers to replace recessed cans. Most areas only allow licensed electrical contractors to change light fixtures, so can lights are commonly sealed with an enclosure made from rigid foam or mineral wool, like those pictured in the article.

Your method may be effective at controlling air leakage, but unfortunately, swapping the fixture with an air-sealed version doesn't address the age and type of the wiring that's supplying it. Since new fixtures require the wiring to be NM-B with a temperature rating of 194°F, I worry that simply replacing the interior of the fixture without changing the wiring could mean that whoever made the switch is liable for damages should there be an electrical short or a fire.

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Design credit correction

We at eMZed Architecture continue to enjoy our subscription to *Fine Homebuilding* and are impressed by all the information your team packs into each issue. That said, I have a little feedback to share with you. In the latest *HOUSES* issue (*FHB* #251), the design for one of our projects was credited to Portal Design instead of eMZed Architecture. I was pleasantly surprised to see the photo, which appears on the bottom left of p. 85, but not excited to see the error. I'm sure it's easy to do, given all the information that goes into each magazine.

—KEYAN MIZANI
via e-mail

your safety

Home building is inherently dangerous. From accidents with power tools to falls from ladders, scaffolds, and roofs, builders risk serious injury and even death. We try to promote safe work habits through our articles. But what is safe for one person under certain circumstances may not be safe for you under different circumstances. So don't try anything you learn about here (or elsewhere) unless you're certain that it is safe for you. Please be careful.

—ROB YAGID
editor

Email your own letter to us at FH@taunton.com.

Don't deck plans need a professional seal?

I read through Glenn Mathewson's piece on deck permits a few times (*FHB* #252), and not once did he mention that you might need an architect's or engineer's professional seal for the deck plan. In a sidebar, he suggests taking time to prepare good detailed plans, but most people are not able to do that. Around here, many plan reviewers require a sealed set. While Mathewson's article was very thorough, I was surprised this did not get mentioned.

—THOMAS O. GRAY, AIA
Pittsburgh

Author Glenn Mathewson replies: Before the 2015 IRC came out, the code had not provided prescriptive methods of deck construction. Because of this, all decks were considered "alternative" construction that technically required a design by a licensed professional. However, the majority of decks are rather simple, and many jurisdictions didn't enforce this technicality. Nonetheless, you are correct that some zealous building authorities require all decks to be professionally designed.

This may change in the coming years as jurisdictions adopt the 2015 IRC. That version of the code prescribes many common details for decks, including ledgers, joists, beams, posts, and all their connections, allowing nonprofessionals to design and build compliant decks without an architect's or an engineer's stamp of approval.

Two tools for pulling nails

Your "What's the Difference?" articles are always great. They help to fill in the blanks with things we know. Your recent article on nail pullers was equally good (*FHB* #252), but I was a little curious why author Don Burgard never mentioned two other popular nail pullers: the 19-in. crescent #56 puller and common nail-pulling pliers. Both tools don't need the assist of a hammer, and the pliers are a one-hand tool. The pliers are particularly great for pulling nails quickly in succession, and you don't have to have your body braced to exert force. It's all hand action.

—J. KAYE
Phenix, Va.

Protection trumps convenience

I read your recent article about controlling your home via a smartphone and WiFi (*FHB* #249). I find this to be scary stuff considering all the people out there who are both brilliant and bent on stealing personal information and property. I do not trust this type of technology, especially when it's tied to my home's security system.

—BILL KAMP
Midlothian, Ill.

Photo: Lincoln Barbour

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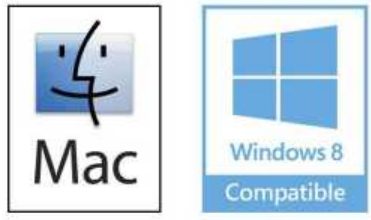

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THE MECHANICS OF HOME BUILDING

Wood rot

BY JUSTIN FINK

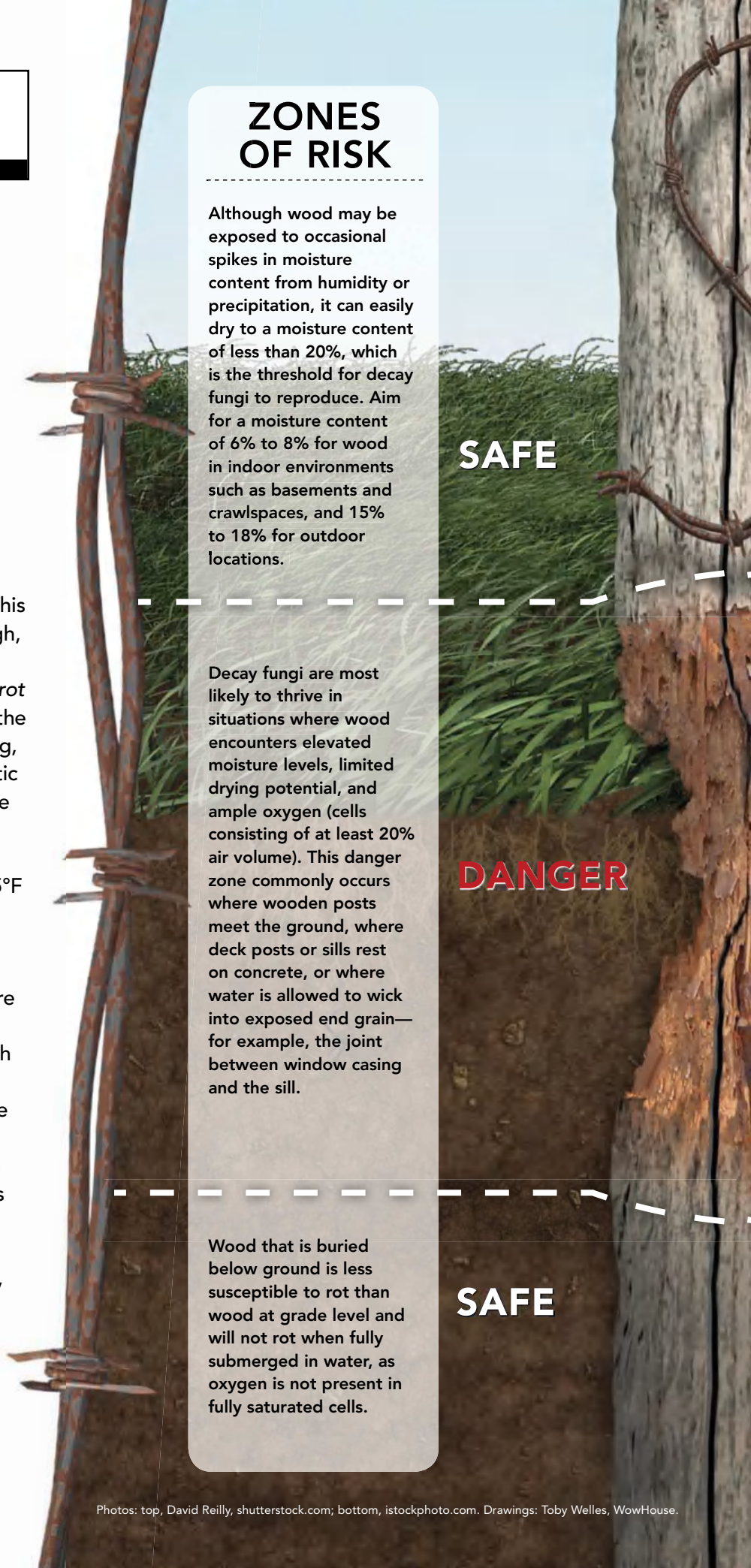
Despite what many people believe, wood doesn't decay simply because it's wet. This popular assumption is understandable, though, because it will never decay without water, no matter the implications of the misnomer *dry rot* (see "Know your rots," facing page). In fact, the slow process of wood decay, known as rotting, is caused by fungi. Much more than a cosmetic nuisance, decay fungi actually break down the cellular structure of wood.

Decay fungi have simple requirements for growth: temperatures between 40°F and 105°F (between 75°F and 90°F is optimal), a wood moisture content above the point of fiber saturation (roughly 30%), and ample food.

Controlling the spores isn't possible (they are everywhere), and eliminating oxygen would be unrealistic, but some conditions for growth can be altered effectively—for instance, chemical treatment can make the food source harder to access. Controlling moisture is also effective, although it only causes the fungi to go dormant and wait for favorable conditions to be restored.

Certain species have heartwood that is naturally resistant to attack from decay fungi, but no wood is completely immune to rot. Here's how it works.

Justin Fink is Project House editor.



Photos: top, David Reilly, shutterstock.com; bottom, istockphoto.com. Drawings: Toby Welles, WowHouse.

THE LIFE CYCLE OF DECAY FUNGI

1. Lightweight fungi spores floating in air land on the surface of wood. If conditions are right, the walls of the spores burst. Small tubes called hyphae branch out, consume free sugars, and then begin to secrete enzymes onto the surface of the wood, breaking it down to make more sugar.

2. As the hyphae spread and multiply, they form a whitish mat called mycelium, which absorbs the nutrients from the wood cells being broken down.

3. When a fungus has been growing for an extended amount of time, fruiting bodies start to form on the surface of the wood.

4. Fruiting bodies form millions of fresh spores that are then carried by the air to other surfaces, allowing the cycle to repeat.

KNOW YOUR ROTS

Brown rot

Primarily limited to coniferous species—a group that includes much of the lumber used to build a house—this type of rot is easily identified by the wood's dry, bricklike appearance and crumbling texture. Although it's often mistakenly called *dry rot*, dry wood cannot rot. The dark brown, cuboidal appearance of this rot is the result of the fungi consuming the light-colored cellulose and hemicellulose in the wood and leaving the darker lignin intact. As the fungus spreads, the unconsumed wood dries and shrinks, cracking both along and perpendicular to the wood grain.

White rot

The type of fungi that causes white rot consumes the cellulose in the wood, just like brown-rot fungi, but it also consumes the lignin, thereby removing the brown color, too. Unlike the cubes left by brown rot, wood damaged by white rot turns to a soft pulp, which shreds into strands when touched. White rot primarily attacks hardwoods and can be found in houses if the wood's moisture content is consistently high enough (at least 40%) to sustain its growth.

tips&techniques

EDITED AND ILLUSTRATED BY CHARLES MILLER

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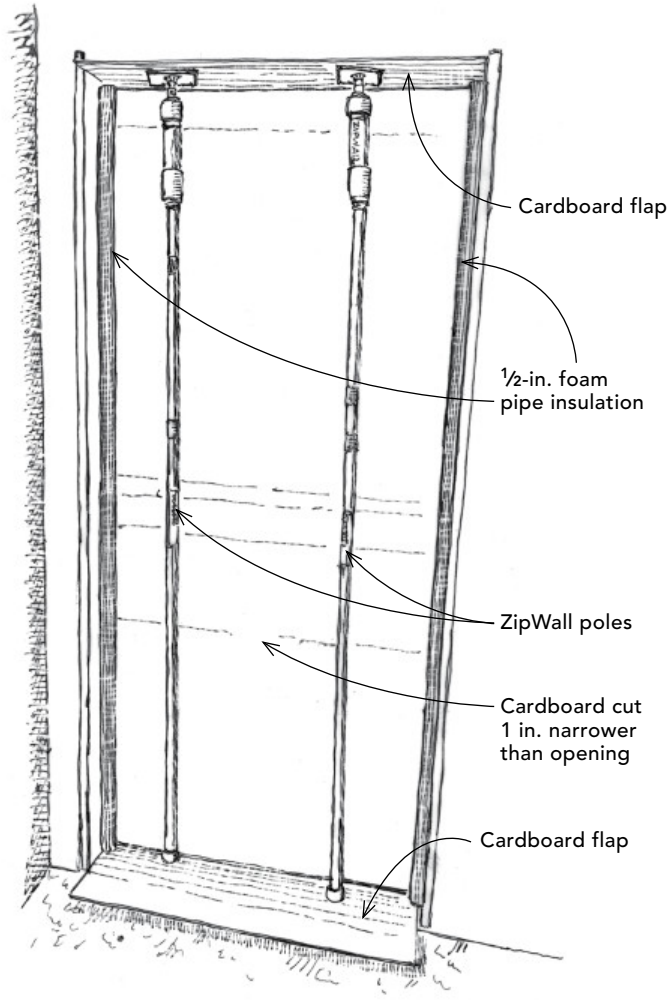
A better doorway seal

Ever need to seal an open doorway during demolition or when sanding joint compound or painting? When I need to do this, I cut a scrap of cardboard 1 in. narrower than the width of the doorway and 8 in. longer than the height of the doorway. ZipWall poles provide the tension to the top and bottom flaps. The sealing effect comes from ½-in. foam pipe insulation slipped onto both sides of the cardboard insert, creating a snug gasket.

—MARGARET GRASSO
Smithtown, N.Y.



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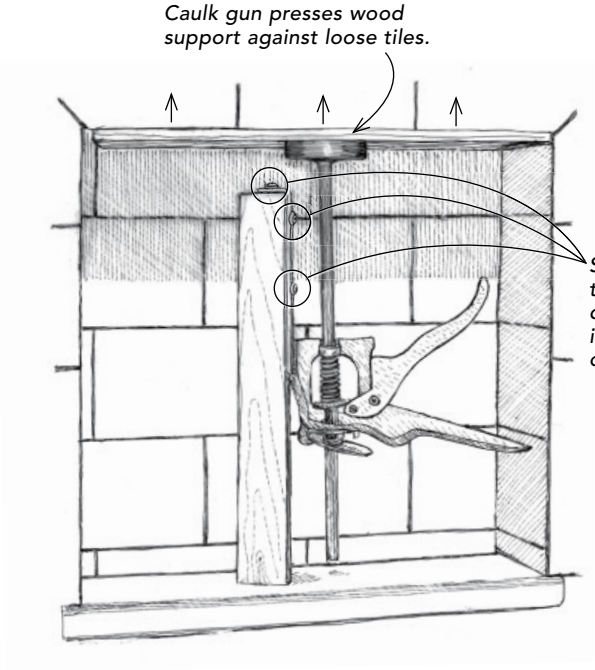

Setting tile with a caulk gun

I fabricated a jig for holding up tile on the ceiling of a small nook I built in a shower wall. It's made from an old skeleton-frame caulk gun and a strip of wood. I cut off one of the rails on the caulk gun, then drilled a few holes in the remaining rail. I cut the wood to length so that it was a couple of inches below the top of the shower nook. I then attached it to the caulk gun with screws driven through the holes I had drilled.

To use my jig, I set a few tiles. Then I place a short strip of wood under them and support it with a few squeezes of the caulk-gun trigger. I've used the same jig with a longer wood post to support tile on the underside of a glass-block window, too.

—JOHN CARROLL
Durham, N.C.

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Don't let blisters slow you down

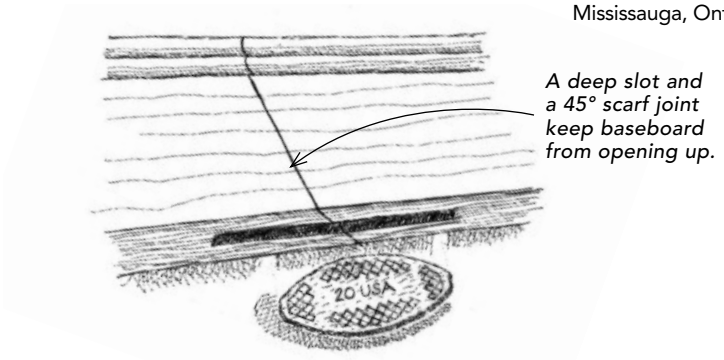
I have discovered the best blister-beater ever: kinesiology tape. It's the stuff all over the shoulders of U.S. Olympic volleyball players. I use it for various muscle aches and pains, but I've found that it protects blistering areas like nothing else. When cut to fit, even between your fingers or around your heel, it stays on for days. Keep a roll in your truck, and tape a greenhorn's hands before he slows and needs time for his hands to heal.

—MARK CLEMENT
Ambler, Pa.

Baseboard scarf joint

When creating scarf joints in long runs of base, I find it tricky to maintain alignment, and as a weak point in the run, a scarf joint is at risk of opening up due to seasonal changes. To overcome these problems, I cut the scarf at 45°, clamp the two halves together, and cut a deep biscuit slot in the bottom edge across the miter. As shown in the drawing below, this slot allows a biscuit to be buried into the baseboard, thus aiding alignment and providing a much stronger glued joint.

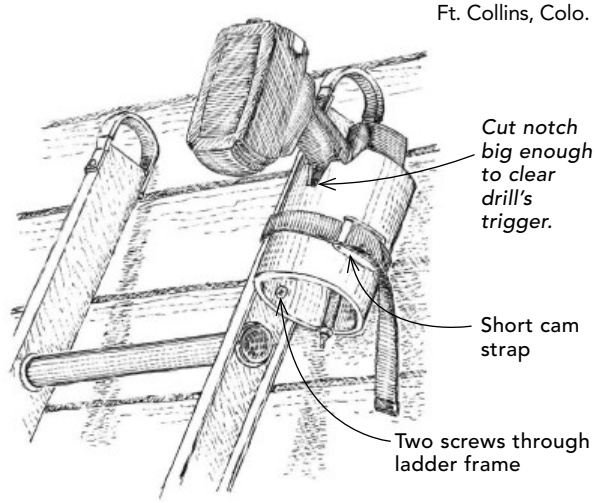
—ROBERT GUNN
Mississauga, Ont.



Drill holder for ladders

Many years ago, I was working on a job site where the electricians had a piece of 4-in. PVC pipe attached to their ladders to hold their cordless drills. As shown in the drawing below, I put one on my ladder with a pair of screws through the ladder frame and a short cam strap for extra protection. The pipe is about 6 in. long, and the trickiest part is cutting a notch that won't depress the trigger when the drill is sitting in the holder.

—CURT LYONS
Ft. Collins, Colo.



A simple trick straightens threads

When you need to cut a machine screw that's too long, thread a nut onto the screw first. Cut the screw, and then back the nut off. It will straighten out any threads that got deformed by the cutting process. You'll probably need a pair of pliers and a screwdriver to do this.

—KEVIN IRETON
New Milford, Conn.

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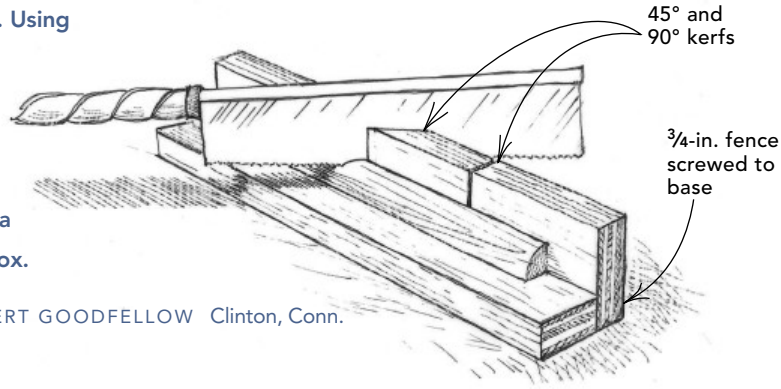
TIP FROM THE ARCHIVES

Shopmade miter box comes in handy

If you've ever lugged a chopsaw onto a scaffold 20 ft. off the ground to cut 1x moldings, you'll appreciate this tool. With some scrap pieces of ¾-in. plywood or pine, you can build a simple miter box that will guide precise cuts. Using a chopsaw, make 45° and 90° cuts in the piece that will become the vertical fence. Attach this piece (now in three sections) to the base with glue and 1⅝-in. drywall screws, leaving no space between the sections.

Using the cuts as guides, make kerfs in the fence with a handsaw. Now you have a lightweight, portable miter box.



—ROBERT GOODFELLOW Clinton, Conn.

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FIELD TESTED

Smart air scrubber

Dust is among the biggest worries of homeowners undergoing a remodel, so why it is that so few remodelers use portable air cleaners, I can't figure out. Air scrubbers make my customers happier and keep me healthier. Thanks in part to the EPA's regulations for working around lead paint, the filtration of the typical job-site air cleaner has gotten significantly better. Unfortunately, the cabinets and features haven't kept pace—until now. BuildClean's new air scrubber, which I've been using on projects both big and small, has some smart improvements over other air scrubbers.

This machine excels at managing dust. The only time it couldn't keep up was when I was cutting concrete with a grinder, but it didn't take long for the BuildClean to clear the air once I stopped cutting.

I've also used the BuildClean during a small insulation job. I could tell that the unit's 360° suction worked great because with the sun streaming through a window, I could see the airborne fiberglass migrating toward the unit, even from 20 ft. away. You also can connect an 8-in. exhaust hose ($66) to the back and run the hose outside to create a negative pressure zone that prevents dust from migrating out of a plastic-enclosed work area.

At 38 lb., the BuildClean is light enough to transport easily, and there's a cage of sorts around it that protects it from job-site bumps and bruises. It would be great if the unit came with a protective case or fit into a large trash can for transporting, which would also protect the expensive filter and contain the small amounts of dust that spill out when you move the thing. Unfortunately, at 23 in. across, the BuildClean doesn't fit in my Rubbermaid Brute, so I protect it by carrying it in a moving blanket.

One of my favorite features is the "auto" setting, which keeps the unit running quietly on low power until it senses dust, at which time it ramps up the fan. I also like the red-yellow-green monitoring system that shows the condition of the prefilter and the HEPA filter and alerts you when either needs replacement. BuildClean claims that the HEPA filter ($150) will last one year because the prefilter ($23), which can be shaken out on the job, catches most of the particles.

If you regularly work in houses full of people and furniture, you'll value the Build Clean. Yes, shelling out almost $1000 for the unit and its filters is a little tough to swallow, but this is a tool that will pay for itself in client referrals and in the considerably less time you'll spend managing dust.

Mark Clement, licensed contractor and co-host of the MyFixitUpLife podcast

Photos: courtesy of the manufacturers

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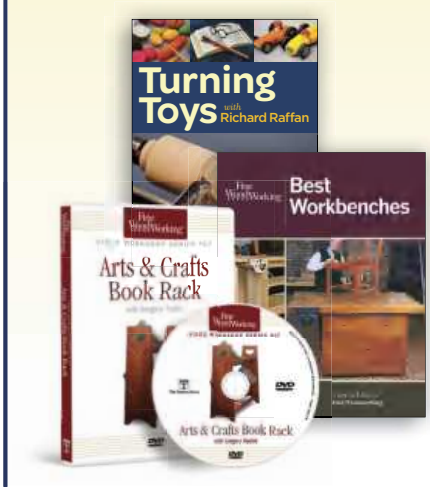
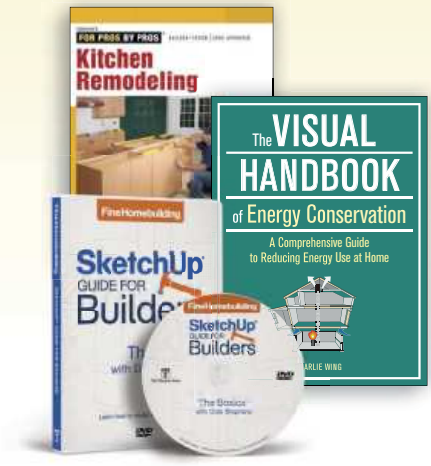


HOME BUILDING



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Quick-to-deploy worksurface

I was walking down the aisle at a recent trade show when with a single shake, a young man transformed what looked like a 9-in. by 14-in. bundle of sticks into a 4-ft. by 8-ft. work platform. The Centipede Portable Work System's operation is somewhat similar to that of those pop-up shelters you see at tailgate parties, although it's faster to deploy. In addition to the 4-ft. by 8-ft., 3000-lb.-capacity Centipede Support XL ($100), the company also offers a 2-ft. by 4-ft. Centipede Sawhorse ($59) with a 1500-lb. capacity. Replaceable "P-Tops" ($15 for six) provide the worksurface and receive the company's Quick Clamps ($15 for four) for holding material and X-Cups ($15 for four) for holding 2x4s.

Patrick McCombe, associate editor

A less expensive platform ladder

About 18 months ago, Werner introduced the Podium ladder. At the time, it was available only in a Type 1A version with a 300-lb. capacity. Type 1A ladders are great for builders, but they're overkill for DIYers and tradespeople who use a ladder infrequently. Werner now offers a 250-lb.-capacity, 5-ft., Type 1 Podium ladder that allows users to reach a 9-ft. ceiling. The guardrail is molded to accept a number of useful accessories, including tool holders, a paint pail, and a fluorescent-lightbulb holder. The Podium PDFS100 sells for $99. *—P.M.*

A new spin on toilets

The VorMax toilet from American Standard eliminates conventional rim holes and rim in favor of a single opening that releases a jet of water at the top of the bowl. The manufacturer contends that this concentrated burst is more effective at sweeping away detritus clinging to the bowl than the multiple rim holes found on most household toilets. It's an approach similar to that used in Toto's Double Cyclone flush system, which was introduced a few years ago, though the VorMax employs one jet rather than two.

Using only 1.28 gal. per flush, the VorMax is certified under the EPA's WaterSense program. It's available in four models, sold by different retailers. The Optum is at Home Depot ($288), the Estate (shown) and the Heritage are sold at Ferguson bath showrooms ($499 to $625), and the Esteem is at Lowe's ($358). All have elongated bowls, a 16½-in.-high seat, and an antimicrobial surface to inhibit bacterial growth.

Debra Judge Silber, design editor

Thrifty subfloor adhesive

Building an average 2000-sq.-ft. home requires about 24 large tubes of subfloor adhesive, but you can do the same job with only three 29-oz. cans of Tytan aerosol subfloor adhesive. The "collapsing gel formula" expands less than other brands of aerosol polyurethane adhesive, so the subfloor stays tight to the framing. Once you've applied it, you have about 15 minutes of working time before you have to lay down and fasten the subfloor, which compares favorably to conventional solvent-based construction adhesives. As the product cures, it expands to fill any gaps that could cause squeaks later. You can use Tytan on wet and frozen lumber and in temperatures down to 23°F. The 29-oz. gun-dispensed can costs $18. Straw-dispensed cans sell for $7 (12 oz.) and $10 (20 oz.). Tytan foam guns start at $16 for an economy model and reach $77 for a top-of-the-line version with a 39-in. barrel. Five other guns are priced in between. —*P.M.*

Pergola uplift protection

Carports, pergolas, and trellises are vulnerable to strong winds or earthquakes, which can toss these top-heavy structures about, endangering people and property. Simpson Strong-Tie's new RPBZ ($5 each) solves this problem. The same bracket can be used to secure double 2x4s as well as 4x4s and 6x6s, and is either attached to concrete footings with threaded rod set in epoxy, or to wood-framed decks using structural screws. The product has a thick zinc coating for corrosion resistance and can be used with Simpson's CPS composite plastic standoff (right, sold separately for $4 to $7) to prevent the post from wicking water. —*P.M.*

Fine footwear

I feel like I've tried just about every type of job-site footwear through the years. I've had several pairs of cross-trainers, which I've found sensible for the office, sticky for the roof, and perfectly suitable for client meetings. Unfortunately, these shoes don't provide much protection when you step on a nail-riddled board. On the other end of the spectrum, I've tried tall, lace-up boots with thick, knobby soles that look more at home on an oil rig than a bathroom remodel.

Since my work involves everything from digging footing holes in freezing temperatures to hanging crown molding in fancy living rooms, I've settled on midweight hiking boots as the best everyday footwear. Unfortunately, boots made for weekend hiking can't hack the job site's day-to-day grind. Even the most expensive versions start delaminating at the toe long before I've gotten my $150 worth of use out of them.

I met a carpenter wearing some good-looking Ariat boots on a recent project, so I thought I'd give them a try myself. After several months of demolition and general home-improvement work, my Impact II 8-in. lace-ups ($165) have held up well.

The soles are harder than those on sneakers or lightweight hikers, so they resist wear nicely, and because the treads aren't too deep, the soles don't cake with massive amounts of mud. The insoles, which have gel cushioning and ankle-stabilizing heel cups, make the boot comfortable all day long. However, it's the classy-looking uppers that I like best—no racing stripes or bling, just leather and laces. My initial concerns about the lacing hooks at the top of the boots getting caught on items around the job site turned out to be unfounded. Only once did I snag one on my truck seat while climbing across the cab.

Finally, I think these boots project an image of professionalism that I'm comfortable with. While I'm definitely not a golf-shirt and iPad guy at client meetings, I still want to appear reasonably refined. —*M.C.*

what's the
HELPING READERS MAKE CHOICES

difference?

DRINKING-WATER FILTRATION SYSTEMS

Carafe, faucet mounted, undersink, and reverse osmosis

Two atoms of hydrogen and one atom of oxygen—this simple formula makes possible the presence of life on our planet. Not only do we humans owe our existence to H_2O, but we must consume it every day for optimal health. The water that comes into our homes from wells and municipal distribution systems contains more than just hydrogen and oxygen, however.

The EPA regulates 86 different water contaminants, and its most recent Contaminant Candidate List (from 2009) includes 116 additional contaminants known to exist in drinking water in the United States that the agency is considering regulating in the future.

To determine if you need to filter your water, start by obtaining your utility's consumer confidence report (CCR). Water utilities are required by law to provide this annual report, which documents the contaminants present in that utility's water system. This will give you an idea of which contaminants you need to focus on. Because a CCR applies to the system as a whole and not to your home's water supply, a more accurate picture of the contaminants you are ingesting can come only through a test of your household water. (For households whose water is supplied by a well, of course, a test is the only way to find out about contaminants.) To find an approved laboratory, go to epa.gov/safewater/labs.

Don Burgard, senior copy/ production editor

CARAFE SYSTEMS

The easiest way of accessing filtered water is by using a carafe with a built-in carbon filter, which traps contaminants in the porous surface of its tiny granules of carbon. Many people choose these systems primarily for the way they improve the taste of tap water, mostly through reducing chlorine, which is added to public water supplies as a disinfectant. Depending on the particular system, they can reduce the presence of a number of contaminants as well. With this type of system, as with all water-filtration systems, read the manufacturer's list of contaminants the system has been tested to filter out to make sure that it includes those present in your water.

Large families may find carafe systems inadequate. The amount of water that a carafe holds may not be enough, and the short life of the filters, which last for about 40 gal. each, may require frequent changing.

Shown Brita Capri, $35 (available at bedbathandbeyond.com); replacement filters, $25 (set of four)

FAUCET-MOUNTED SYSTEMS

The base in these systems attaches directly to the faucet after the aerator has been removed, then a replaceable carbon-filter cartridge is inserted into the base. Though much more convenient than the carafe systems, even the slimmest faucet-mounted system can look like an ugly appendage, especially if it doesn't match the finish of the faucet. (Some manufacturers offer systems in a variety of finishes.) Depending on the model, filters in faucet-mounted systems last for between 100 gal. and 200 gal. These systems are meant to be used with cold water only; hot water can damage the filter.

Faucet-mounted systems can reduce the water flow, sometimes significantly. This optimizes the work of the filter, but it may be a nuisance if you need lots of filtered water at a given time. A switch allows you to bypass the filter when washing dishes or hands. On this setting, the flow rate is normal.

Shown Pur Advanced Faucet Water Filter, $47 (stainless steel); replacement filters, $36 (set of two)

Photos: top, courtesy of Bed Bath & Beyond; bottom, courtesy of Pur

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SIKKENS® Wood Finishes have been renamed SIKKENS® PROLUXE™ Wood Finishes. While the name and labels have changed, the formulas have not.

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UNDERSINK SYSTEMS

Installed (where else?) under the sink, these systems are connected to the cold-water line. Aside from the dedicated faucet they require—which allows you to run unfiltered water from the main faucet, thereby extending the life of the filter(s)—their presence is invisible. Undersink systems are available with one, two, or three filters. One-stage systems include a carbon filter. Two-stage systems may include two carbon filters, or they may include one carbon filter and one sediment filter. (If your tap water contains a lot of sediment, a sediment filter can keep the carbon filter from clogging.) Three-stage systems usually include two carbon filters and one sediment filter. The more filters you have, the longer you can go between changes. For example, Aquasana's three-stage system filters 600 gal., while its two-stage system filters 500 gal. and its one-stage system filters just 200 gal.

Shown Aquasana three-stage system, $200; replacement filter set, $65

Photo: courtesy of the manufacturer

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REVERSE-OSMOSIS SYSTEMS

Reverse osmosis (RO) is a technique used by some municipalities and military units to transform seawater or water that's otherwise unfit for human consumption into potable water. On a much smaller scale, RO systems can filter household water as well.

Typically installed under the sink, an RO system begins with either two carbon filters or a sediment filter and a carbon filter. From there, water moves through a filter with a semipermeable membrane that allows water to pass but not contaminants that are larger than a water molecule. The water then proceeds to a storage tank. When the dedicated faucet is turned on, water flows directly to it or through one more carbon filter first. The filters in an RO system usually need to be replaced annually.

RO systems get high marks for thorough filtering, but they come with at least three drawbacks. First, the large space they require limits the storage capability of the undersink area. Second, they filter out the minerals that give water its taste and that are necessary for optimal health. People who eat a well-balanced diet get most of these minerals from their food, but a study reported by the World Health Organization found that when food was cooked in demineralized water, it lost much of its mineral content. Third, the contaminants that the membrane filter traps need to be flushed out by water flowing in the opposite direction of the purified water. This water simply goes into the drainpipe. As a result, an RO system consumes far more water than it produces for drinking. In fact, a three-to-one ratio is not uncommon.

Shown Environmental Water Systems Essential RO three-stage system, $515; replacement filter set, $275; replacement membrane filter, $150

Photo: courtesy of the manufacturer

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Moveable Feast with Fine Cooking returns to PBS TV this fall.
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Refinish Your

Uncover the beauty in old hardwood flooring with a little patience and some great professional advice

BY BRENT KELOSKY

Although my company does all types of flooring installations, our bread and butter has always been refinishing worn hardwood. Our goal is to uncover the beauty under the decrepit surface of the floor, which involves no small amount of labor.

When we arrived on-site for the job shown here, the wall-to-wall carpeting had already been removed, revealing 750 sq. ft. of severely worn red-oak flooring that appeared original to this old Pennsylvania farmhouse. Although we got back down to bare wood quickly, that's just the beginning of a job like this.

The job took a two-person crew just under five days to complete and cost about $4.50 per sq. ft. in labor and materials. Refinishing a hardwood floor is an admittedly disruptive process, but you realize it's worth it when you first set eyes on the results.

The materials are straightforward—just a single coat of stain, a coat of sealer to lock in the stain, and two coats of polyurethane to provide the wear layer—but breathing new life into an old wood floor takes a lot of patience. It all starts with sanding.

Sanding will make or break your job

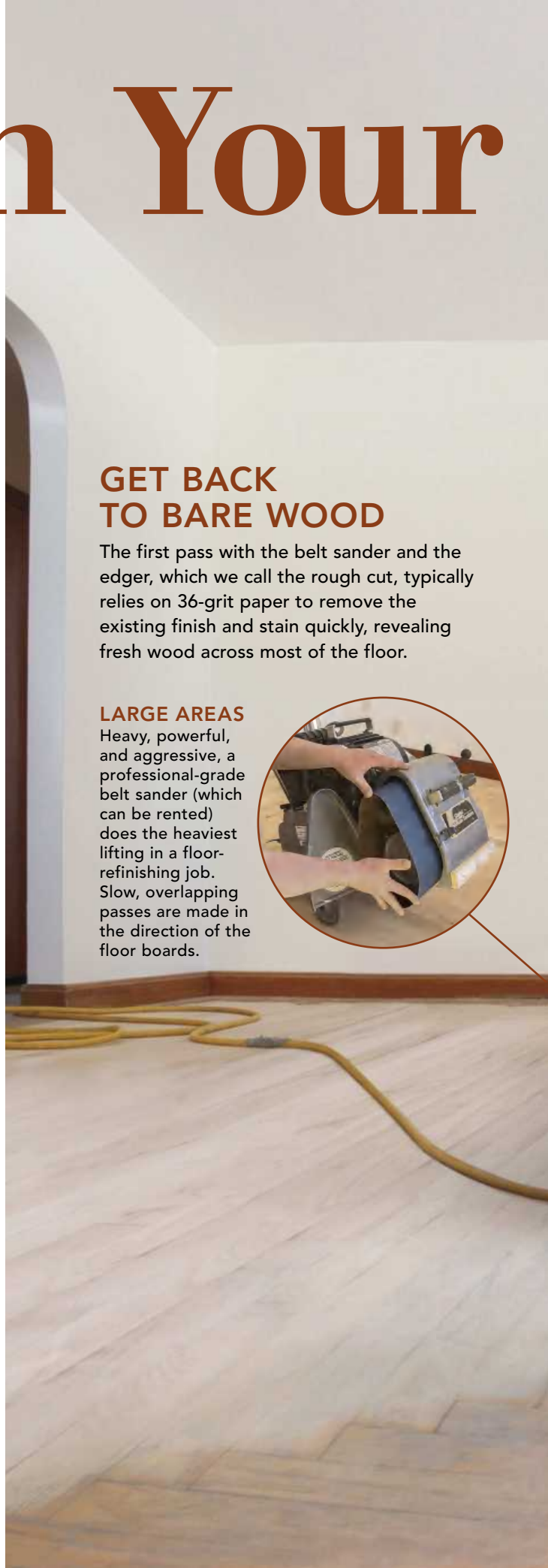
Without question, the critical difference between a professional-looking finished floor and a poor attempt is how much care is taken during the sanding stage. Although you're only removing 1/16 in. or so of actual wood, the sanding process takes multiple days—that is, if it's done correctly.

In addition to some common hand and power tools, there are three specialized tools we use on our jobs: a belt floor sander, an orbital edger, and a buffer.

The bulk of the sanding work is handled by the large, very aggressive, 220v belt sander. Run back and forth through the room, working in the same direction as the floor's wood grain, the belt sander is used to take slow, overlapping passes.

Although an upright orbital sander is the most common tool available at rental yards, we prefer to use a belt sander. (A drum sander is also an improvement over the orbital.) An orbital sander is a fairly gentle and forgiving tool, which may seem appealing if you're unsure of your abilities, but it also requires much more time to do the job. On badly damaged floors, you'll likely give up long before you get the blemishes sanded out.

A belt sander runs on wheels and uses a lever to lower the machine—which puts the sanding belt in contact with the floor surface—and then to lift it away. Because the machine is so aggressive, you can't allow it to sit in one spot for even a couple of seconds or you will end up with significant



GET BACK TO BARE WOOD

The first pass with the belt sander and the edger, which we call the rough cut, typically relies on 36-grit paper to remove the existing finish and stain quickly, revealing fresh wood across most of the floor.

LARGE AREAS

Heavy, powerful, and aggressive, a professional-grade belt sander (which can be rented) does the heaviest lifting in a floor-refinishing job. Slow, overlapping passes are made in the direction of the floor boards.

Wood Floors

EDGES

A powerful orbital sander known as an edger sands the flooring around the edges of each room and in any areas too small to be handled by the full-size belt sander.

CORNERS

Scraping with a handheld draw scraper followed by some hand sanding quickly reveals bare wood in corners and around details where a sander won't fit. Wherever the scraper goes, so does a metal file, which is used frequently to hone the scraper's cutting edge.

Dealing with damage

We often see pet stains, traffic patterns, knife marks along the edges of the room left from the carpet installation, and missing wood or abandoned registers. Our first choice is always to sand out the damage if we can, but damage often extends beyond the missing, scratched, or dented wood.

Sanding can't fix everything, and often it's impossible to predict whether a damaged section can be sanded out until you try. For areas that can't be remedied with sanding, there are two options: acceptance or board replacement (see "Building Skills," p. 88).

When sanding damaged areas, we take several passes with the belt sander at a slight angle to the wood grain, alternating the angle of the machine between each series of passes. It sometimes helps to spray the surface of the damaged flooring with water—just enough to wet it evenly—between passes with the belt sander. The water raises the grain of the wood, lifting deeper stains to be within reach of the sander.

We typically don't bother filling large gaps with putty. Experience has taught us that the camouflage rarely lasts and that this repair isn't worth the effort. It's extremely difficult to fill an entire void, and seasonal movement combined with vibrations of walking usually open the gaps again. These imperfections are often best left as they are.

gouges. It should be lowered to the floor as it's being moved forward to start a pass, then lifted back off at the end of each pass.

A powerful handheld orbital sander called an edger is used to sand the perimeter of the room and any areas where the larger machine won't fit. The smallest details and corners are done by hand with a scraper and sandpaper. Later in the process, a buffing machine is outfitted for finer sanding, but first comes the rough cut.

Sand incrementally and patiently

Although it's not the coarsest option in our arsenal, 24 is typically the lowest grit we use for the rough cut. Such a coarse grit is only necessary when a floor has lots of built-up wax on the surface, and even then it's pretty inefficient for removing actual wood. In most cases, we start with 36-grit sandpaper, which removes the existing topcoats and stain, revealing fresh wood across most of the floor. From there, we sand the floor twice more with 50-grit and 80-grit paper, spending additional time on problem areas such as deep scratches or surface stains (see "Dealing with damage," left).

A crucial step that's often not considered by first-timers is blending together the sanding patterns from the belt sander and the edger. Because they have different weights, operate at different speeds, and are run in different directions, these two machines leave the sanded floor looking and feeling inconsistent, even when they're equipped with the same grit of sandpaper. The remedy for this problem is a random-orbit sander.

Even though we use 80-grit paper with the belt sander and the edger, experience has taught us that the random-orbit sander should be equipped with 60-grit paper, which roughs up the perimeter of the room and any other areas where the two machines had overlapping passes. Although it seems counterintuitive, this ensures that the stain penetrates evenly. A final pass with the upright buffer machine is the last step in the sanding process before the floor undergoes a thorough vacuuming.

Staining is done by hand

Although water-based stains are an option, I've found them to be inferior to oil-based products, especially in getting even stain color in large rooms. Along with the sealer and topcoats that come after it, we use stain from Bona Kemi. When using multiple cans

SAND WITH PATIENCE

Although the sanding progress isn't as dramatic as during the rough cut, the incremental passes with belt sander, edger, buffer, and random-orbit sander are crucial and demand a slow, methodical system.

Track your progress. *To ensure that no spots are skipped, use a hard piece of rubber to mark across the grain of the floor before sanding. Rubber is more reliable than a marker, which can dry out quickly.*

Back it up one grit. *Use a random-orbit sander to retouch the edges of the room. Although the rest of the floor is sanded to 80 grit, use 60-grit paper here to avoid a halo effect around the room's perimeter.*

BUFF TO BLEND

The final sanding pass is done with a buffer that's equipped with a multidisk head and 80-grit paper. This setup blends the scratch patterns of the belt sander and the edger, ensuring a uniform look when stain is applied.

STAIN BY HAND

When working in large, open areas, the fastest option is to apply the oil-based stain using a pad on the buffer machine. But for most jobs, the best way to apply stain is also the most labor-intensive: wiping it on by hand.

Use the floor as the sample board. *The most accurate way to decide between stain colors is to apply the stain options right to the floor after the first or second pass with the belt sander. They can then be sanded out with the next pass.*

A two-person staining team. *Working on padded hands and knees to prevent moisture spots that will keep the stain from penetrating evenly, the first person wipes the stain on using a folded cotton cloth while the second person follows behind, using another cloth to work the stain into the wood in a firm, circular rubbing motion.*

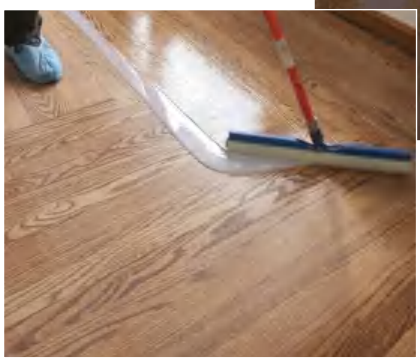
TOPCOATS SHARE THE SAME TECHNIQUE

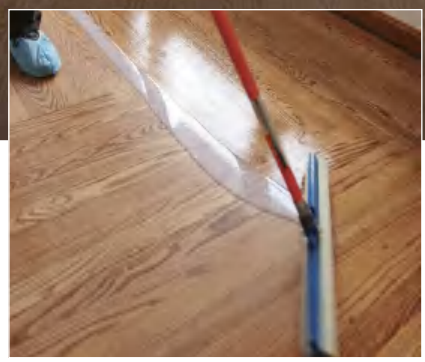
The topcoats on a floor—from the single coat of sealer through the two coats of water-based polyurethane—are applied using the same tools and techniques. Make sure to buff the floor after the seal coat, but you shouldn't need to sand between or after the coats of polyurethane.

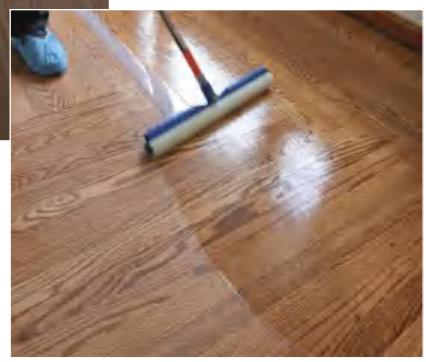
Edges come first. *Working just ahead of the person applying finish with the T-bar, coat the perimeter of the room by pouring a thin line of finish directly onto the floor, then spreading it with a handheld applicator pad.*

The snowplow approach. *A T-bar applicator pushes the finish evenly across the floor. To prevent buildup at the edges of the room, apply each row by flowing it smoothly into the next using a continuous curving motion (photos below). Apply four to five overlapping rows at a time, which is about the limit of what can be reached easily without stepping in the wet finish.*

Retouch the curves. *Remove the perimeter curve marks by feathering the finish from the edges of the room inward, wringing excess from the T-bar by pressing it firmly on the unfinished part of the floor.*







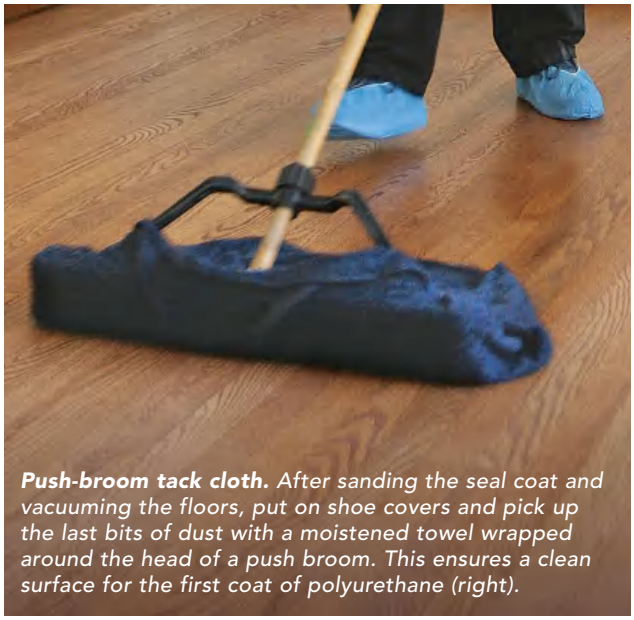
of stain, we combine them in one bucket to ensure that the color is uniform. We apply the stain with a lint-free cloth, then wipe the excess before it dries in place.

It's critical to protect the unstained portions of the floor from moisture as you work. Water in the wood causes that part of the floor to absorb pigment differently, and even something as subtle as perspiration through the knees of your pants can leave discolored blotches in the finished floor. Always use disposable shoe covers when you're walking the floor; bare or socked feet are an absolute no. Kneepads are essential, as well as a rag under each hand. In hot weather, a cloth tied around the head will catch sweat dripping from your brow.

Sandpaper scratches that went unnoticed during the previous floor-prep phase often become obvious as they trap pigment during the stain application. These scratches can be sanded by hand with the same 80-grit paper used in the last pass of the sanders and then recoated right away with stain. There's no need to bother with the vacuum.

When the schedule allows, we like to let the stain dry overnight. If the sealer will be applied later the same day, we check for dryness by wiping a white cotton cloth across the stained surface. If no stain is transferred to the cloth, it's dry enough to move on to the seal coat, which is a waterborne product used to separate the stain from the topcoats that come next. Depending on the brand of polyurethane, the sealer may not be a strict prerequisite, but we use it to provide an extra layer of build above the stain, which enhances the visual depth of the topcoats. After the sealer dries, minor blemishes and nail holes can be filled with a putty that matches the stain color before the entire floor is abraded with the buffer. Then the floor gets another pass with the vacuum, followed by a pass with tack cloths to pick up any remaining dust.

Smooth the seal coat. *Supplement a maroon (very fine grit) buffing pad with strips of 180-grit adhesive sandpaper to smooth out the dried coat of sealer, being careful not to walk on buffed surfaces.*



Push-broom tack cloth. *After sanding the seal coat and vacuuming the floors, put on shoe covers and pick up the last bits of dust with a moistened towel wrapped around the head of a push broom. This ensures a clean surface for the first coat of polyurethane (right).*

Waterborne polyurethane is the most durable choice

Although we use oil-based stain, we switch to a waterborne product for the polyurethane topcoats because the waterborne products have lower odor and faster dry times and are actually more durable than oil-based topcoats. For sheen, I encourage customers to opt for either satin or semigloss because wear patterns from pets and foot traffic are more obvious on floors with high-gloss finishes.

A small handheld foam pad is used to apply the polyurethane around the perimeter of the room, around details such as balusters and hearths, and in small areas. While the edges and details are still wet, a T-bar with a spongy applicator pad spreads finish across the rest of the floor in rows that follow the direction of the grain.

Optimum conditions for drying the topcoat are temperatures between 65°F and 80°F, with 40% to 60% relative humidity and some air movement to help wick away moisture, but not so much that it blows dust around.

The coat of sealer and the first coat of polyurethane are typically dry enough for a recoating in about four hours, but we never apply more than two coats of finish in a single day. My advice here is not to rush it, because the most recent coat of finish always dries faster than what's under it, and you don't want to risk trapping moisture, which leads to adhesion problems.

There should be no need for sanding between or after coats of polyurethane. After the last coat, the floor can be walked on gently in about four or five hours, but restrict normal foot traffic for 24 hours. Anything that might prevent drying, such as an area rug, shouldn't be replaced until after seven days to allow the finish to cure fully. □

Brent Kelosky is vice president of Wood Floor Designs in Koppel, Pa. Photos by Justin Fink.

Fixing Common Gutter Blunders

Design and install gutters as if they prevent damp foundations, peeling paint, and mold—because they do

BY BRENT BRIGGS

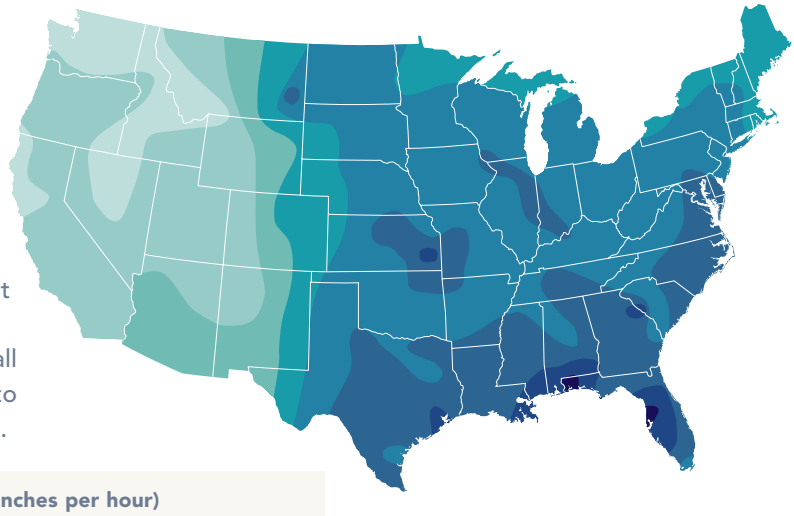
As a home-improvement contractor for the past 30 years, I've seen an inordinate amount of damage to homes that can be attributed to rain-gutter problems. From stains on the siding, to major foundation problems, to flooded basements and interior mold, poorly installed rain gutters always cause a host of problems. Here are fixes for the most common ones I encounter. Many of these problems can be corrected easily, except for poor roof design, which is often based more on looks than practicality and is very difficult to change after the roof has been built. Even then, installing a larger gutter or increasing the number of downspouts can make a difference. Here, I explain how to get gutters right the first time, including how to size them correctly based on roof size and climate.

Brent Briggs is a remodeling contractor in Kintnersville, Pa.

Sizing gutters and downspouts

Most builders default to 5-in. K-style gutters, the most commonly available size and style. Yet correctly sizing gutters is simple and can prevent them from being overwhelmed with rain. Gutter capacity is directly related to downspout capacity: Double the number of downspouts, and you can nearly double the capacity of the gutters.

Calculate the area of roof draining into each downspout (length × width). For a roof pitched more steeply than 5-in-12, multiply the area by 0.85. Find your design rainfall intensity from the map, and match it with your roof area to determine the recommended gutter and downspout size.



Example

Say that the roof area to be drained measures 21 ft. by 40 ft. (840 sq. ft.), that the pitch is 4-in-12, and that the local rainfall intensity is 5 in. per hour. That requires at least a 5-in. K-style gutter with at least a 2-in. by 3-in. downspout.

Rainfall intensity (inches per hour)									
3	4	5	6	7	8	9	10		
Roof area (square feet)								Gutter size and type	Downspout size
775	581	465	387	332	291	258	232	5 in. half-round	3 in. dia.
1272	954	763	636	545	477	424	382	6 in. half-round	3 in. or 4 in. dia.
763	572	458	382	327	286	254	229	4 in. K-style	2 in. by 3 in.
1399	1050	840	700	600	525	466	420	5 in. K-style	2 in. by 3 in. or 3 in. by 4 in.
2279	1709	1367	1139	977	854	760	684	6 in. K-style	3 in. by 4 in.

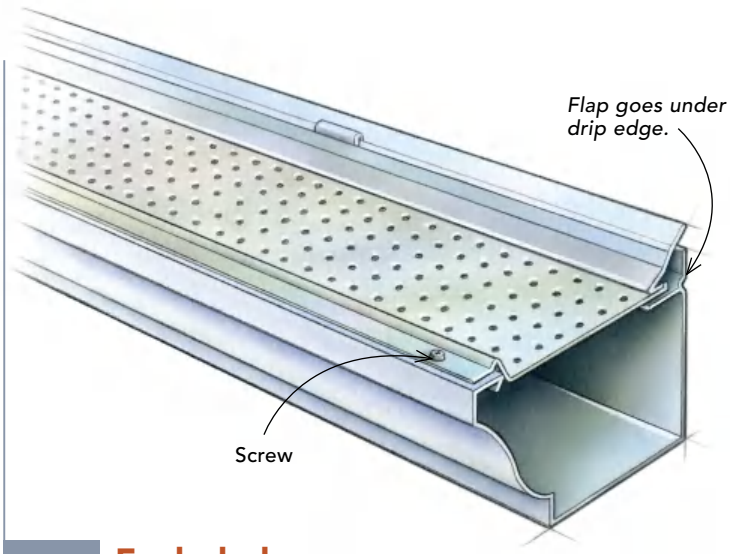
Photo: courtesy of the author

GUTTERS DONE WRONG

Gutter problems often begin with an architect or designer drawing a roof without considering how to handle water runoff. The problems can be compounded with inadequate gutters and downspouts, poor workmanship, and leaves.

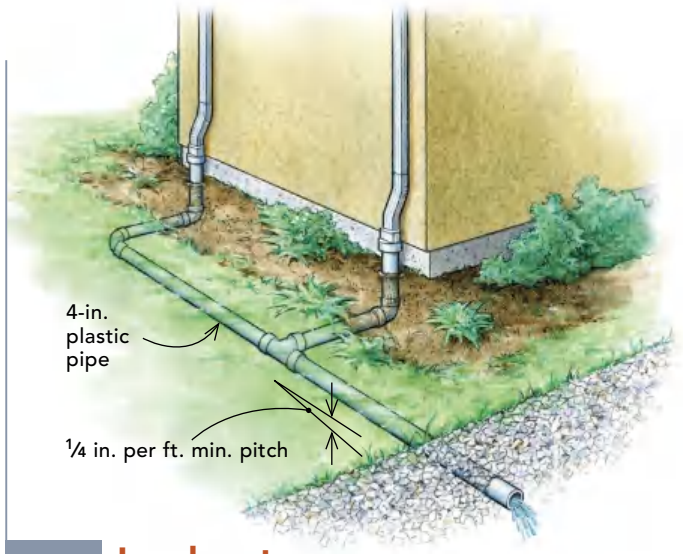
NINE WAYS TO DO GUTTERS RIGHT

Fixing the gutter blunders exemplified on the house shown here requires a three-pronged approach. The first is good design: Avoid details that concentrate flows, and size gutters for the climate and roof size. The second is proper construction: Pitch gutters to drain, and install them with an eye to avoiding restrictions that cause clogs and overflows. The third is the right materials: Use durable sealants, fasteners that stay tight, and quality guards that keep out leaves and debris.



1 Exclude leaves

Trim overhanging trees, and use gutter guards. PlyGem's guards ($3.20 per ft.) also stiffen gutters, so they're less likely to bend if a ladder is leaned on them.



2 Lead water away

Buried pipes lead water to daylight or to a dry well at least 10 ft. from the house.

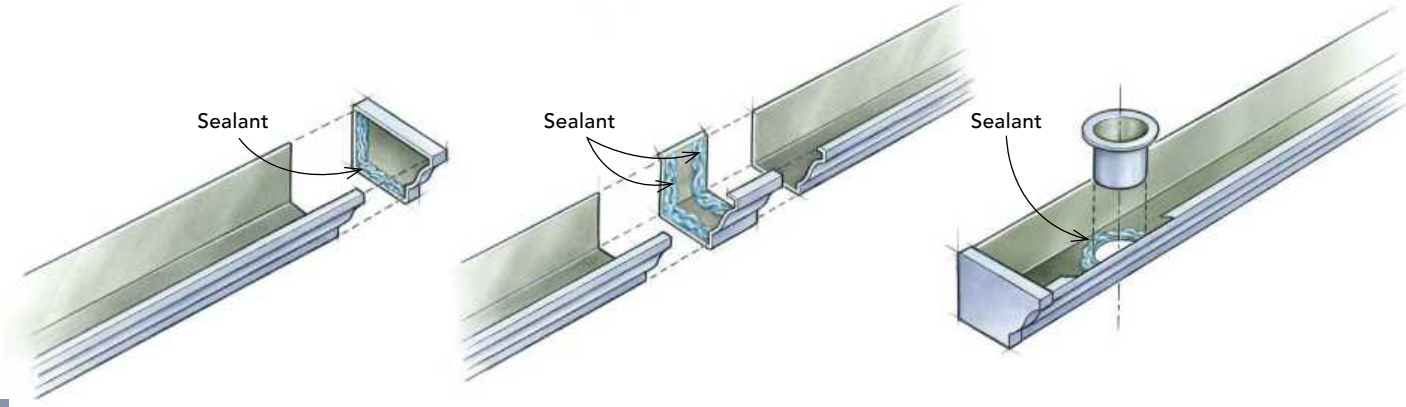
3 Install more downspouts

If gutters are longer than 30 ft., pitch them from the middle toward a downspout on each end. The second downspout doubles the capacity of that gutter.

4 Pitch gutters properly

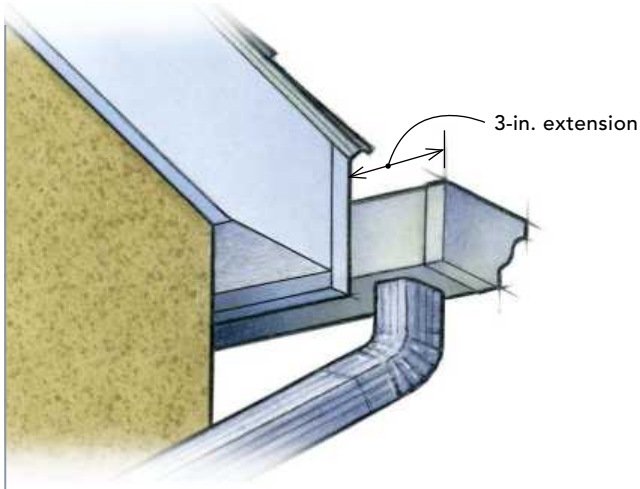
To keep water moving, pitch gutters at least 1 in. over their length. A greater pitch is better but may not look as good.

Drawings: Don Mannes



5 Use the right sealant

To avoid slow drips at joints, use elastomeric sealant such as Quad or GeoCell that resists UV rays and stays flexible for the long term.

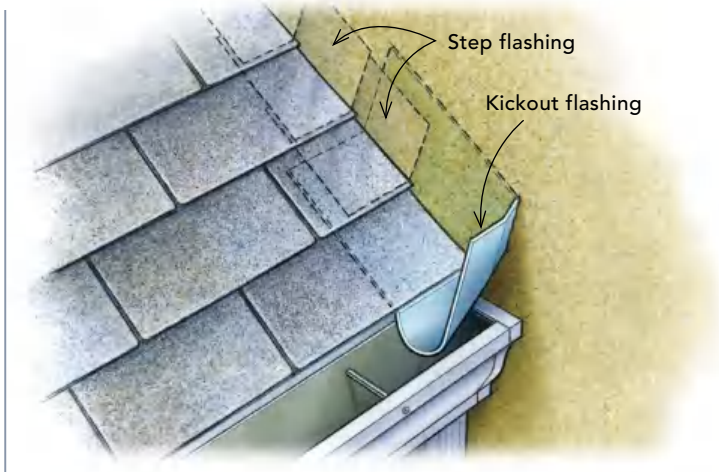


6 Extend corners

To hide downspouts on the side of a house, extend the gutter 3 in. beyond the eave.

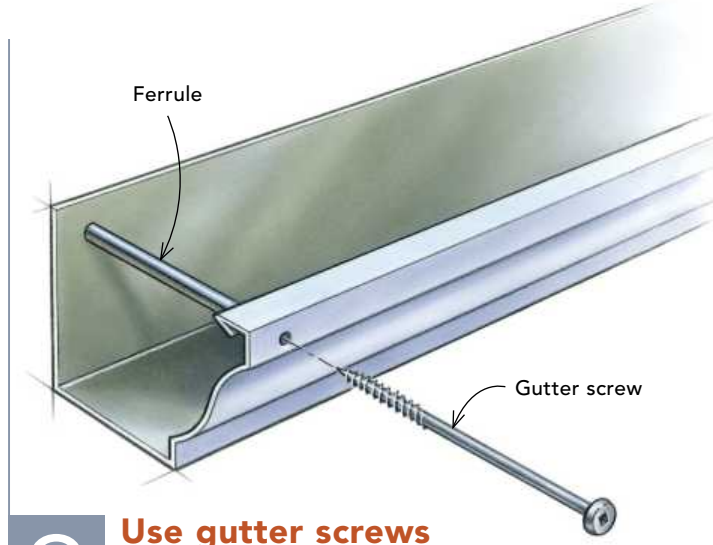
7 Design wisely

The best roofs don't concentrate flow, and their upper gutters drain through downspouts leading to lower gutters and downspouts.



8 Install kickout flashing

Integrated with the step flashing by the roofer, kickout flashing diverts water away from the wall and into the gutter.



9 Use gutter screws

Unlike spikes, which back out and allow gutters to sag and overflow, screws hold tight.

A New Face for

An architect applies a modern mountain vibe

Early in my career, I worked in Montana for firms that designed mountainside estates and ski chalets with a rustic air typical of Western architecture. Eventually, Montana's vast, uncluttered landscapes inspired in me a desire to explore a more contemporary interpretation. Rather than create ornate objects on these landscapes, I began to focus on simple forms and durable materials—homes with large windows and free-flowing interiors that, for me, captured the natural grandeur of the West. With this as my mission, I opened my own practice in residential design and construction management with a contemporary spirit.

I retained that sensibility when, with the birth of our first daughter, my wife and I decided to move east, closer to our families. We chose the village of Stowe, Vt., for its tight-knit community and the mountain lifestyle we'd become accustomed to. Our goal was to buy a modest home that we could remodel into something truly our own.

We purchased an 1800-sq.-ft. Cape in the heart of the town that offered a great location near the mountains, a bike path, and village amenities. The house itself, however, left much to be desired. The traditional floor plan consisted of small, closed-off rooms with tiny hallways, a tight kitchen, and outdated finishes—both inside and out. Nonetheless, we saw potential. We decided to remodel the place to emphasize the house's New England charm, adding design elements that matched our own aesthetic and our growing family's needs. By breathing new life into the old structure, we would create a home that expressed our lifestyle but still adhered to its own sense of place.

"Before" photo: courtesy of the author

an Old Cape

to a New England icon

BY BRIAN HAMOR

It did not turn out to be that simple. As we began the demolition, it became apparent just how poorly the house was built. The framing was undersize, and the electrical and plumbing were not up to code. The heating system was outdated and needed to be replaced. Faced with either patching the building back together or increasing the scope of the work, we chose the latter, stripping the building down to the studs and subfloor and rebuilding it. This also gave us an opportunity to make the house more energy efficient, as our first year in the house was met with exorbitant heating bills (see sidebar, p. 53). We added Energy Star standards to our goals and incorporated durable materials that could withstand the harsh northern climate with little maintenance. Although these decisions doubled our budget and added two and a half months to the construction schedule, they also

A new aesthetic. *In remodeling his own home, the author gave a distinctively modern look to his family's traditional Vermont Cape.*

DORMERS WITH "FLARE"

The flared trim on the house's dormers is the number-one feature people ask me about. It looks complex, but it's really just an extension of the cheek walls to meet the roof overhang. It's also not new; I've seen this detail on the Western agrarian buildings I admire, and it has been used by other designers (although I haven't seen it on dormers). To create the flare, we extended the cheek-wall sheathing to the edge of the roof overhang. With both the housewrap and the cheek-wall trim in place, we trimmed out the interior of the flare with three 15-in. poplar boards assembled with biscuit joints and coated on all sides with epoxy paint for durability. Set at a 45° angle, the trim pieces enhance the visual effect of the flare.

gave us more flexibility in reworking the floor plan and in remaking the home according to our own spin on the mountain aesthetic.

A new face in the neighborhood

The typical East Coast interpretation of Western design tends toward lodges with lots of stone and soaring fireplaces—similar to the buildings I worked on early in my career. My own expression of Western design, in contrast, is derived from the agrarian and industrial buildings I admired there. Those barns, silos, and mills have simple forms designed and built for a specific purpose, without outside influences or restrictions. Simple yet refined details focus only on what is required. This results in buildings that become part of their place and that respond directly to the climate and to their intended use.

Our vision for our home was to embrace this approach while honoring the architecture of New England. Sculptural elements would add artistry to the facade without losing the Cape vernacular. The most noticeable of these is a detail on the dormers and the front corners of the house that I refer to as a *flare* (see "Dormers with 'flare,'" left).

For the exterior, we selected fiber-cement clapboards, standing-seam metal roofing, and local poplar wood trim to withstand the harsh weather with very little maintenance. White clapboard siding and multi-lite white windows honor the original Cape. We chose

Marvin Integrity double-pane windows and doors for their contemporary look and fiberglass construction, and because they were more energy efficient than other windows and doors at our price point. This allowed us to strike a balance between an efficient envelope and an interior enhanced with natural light and ventilation.

A modern floor plan that celebrates simplicity

Winters in Vermont are long, which means you spend a lot of time inside. We wanted to create an open floor plan that would let our family be together even when engaged in separate activities but that also would offer a quiet place—in the form of a media room that closes off from the dining room—as a retreat. In order to remove the old load-bearing walls and open up the living space, we cut in a steel beam to support new metal floor joists that bear the weight of the second-floor and roof loads. To maintain a single flat ceiling plane in the main living space, we used a wide beam that was shallow enough to fit within the floor framing that remained after the demolition.

A woodstove in the center of the house provides supplemental heat and is a gathering point. Expanding the kitchen off of the main living

Energy-smart: A tight house on a tight schedule

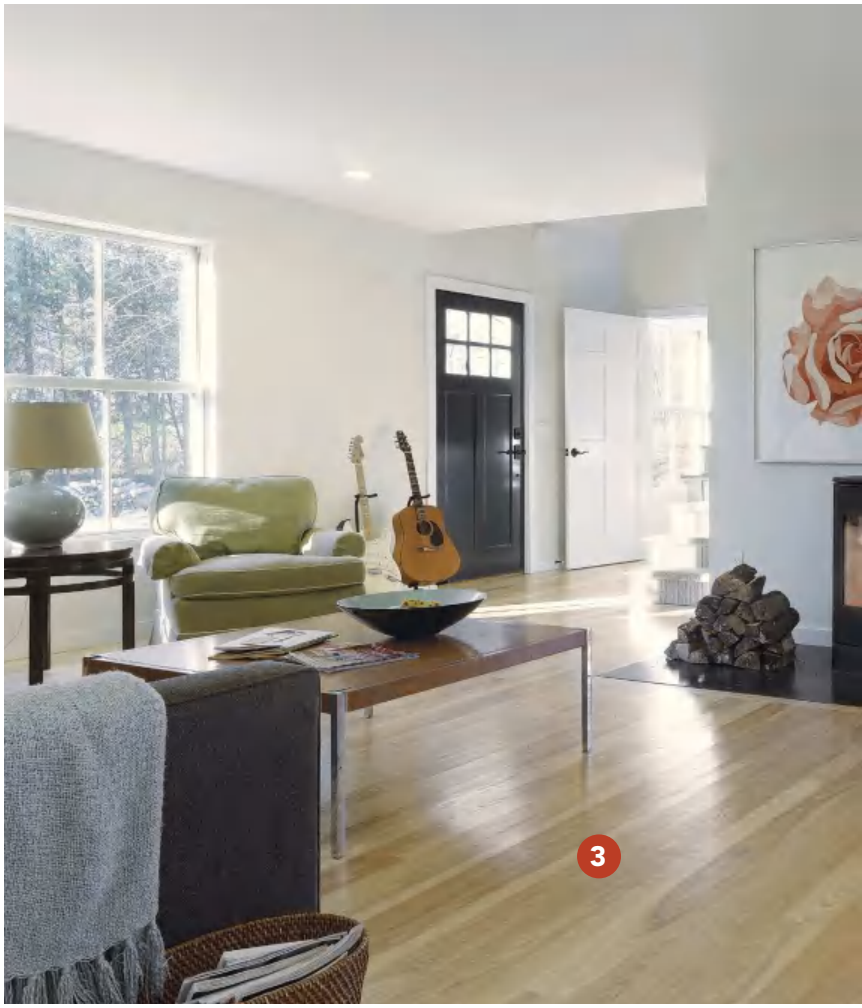
Hit with heating costs of more than $6000 in our first six months in the house, we decided to boost the house's efficiency by eliminating as much of the old structure as we could and retrofitting what remained with energy upgrades we could afford.

Retaining the original 2x4 wall structure, we added Corbond spray foam to boost R-value and provide an air seal with a vapor barrier. The original Homasote sheathing did have some thermal benefits, so rather than remove it, we added an additional layer of sheathing for strength. We installed an HRV and exhaust-fan timers for controlled ventilation.

Rather than replace the existing oil furnace and hot-air system, we installed radiant-floor heat with multiple zones powered by a 120,000-Btu Rinnai tankless heater. We paired the system with a Morso woodstove for more responsive heating during spring and fall and additional comfort in the winter.

Although our remodel added almost 1000 sq. ft. of heated space to the house, our heating costs have been cut roughly in half. In the summer, the house is also much cooler and better ventilated.

Climate control. *The wide-open mudroom features porcelain tile that readily transfers heat from the radiant tubes underneath.*

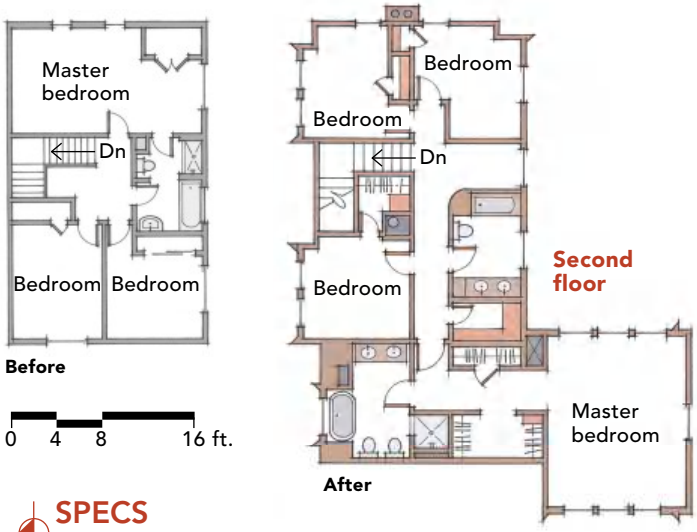


SIMPLE, NO-FUSS DETAILING

With the intention of creating an interior that is calm and uncluttered, we designed the new space with smooth surfaces, a light palette, and refined yet simple trim.

1. Large windows flood the interior with daylight and maximize ventilation in the summer months.
2. To accentuate the simple rectangular and square window forms, we picture-framed their interiors with minimal 5/4 painted poplar extension jambs that project beyond the drywall about ¼ in. to ½ in., depending on the window.
3. Light-colored ash flooring with a water-based finish provides warmth and a neutral background.
4. White, flush-mount LED recessed can lights add to the simplicity of the interior ceiling plane.
5. Off-white wood, tile, and drywall surfaces reflect, absorb, or bounce light to the interior.
6. The absence of wall cabinets in the kitchen accentuates a simple, clutter-free interior. Tile on the north wall of the kitchen helps to reflect natural light into the space.

Floor-plan drawings: Martha Garstang Hill



SPECS

Bedrooms: 3 upstairs, 1 in basement (before); 4 upstairs (after)

Bathrooms: 1½ (before); 2½ (after)

Size: 1980 sq. ft. (before); 2800 sq. ft. (after)

Cost: $170 per sq. ft. **Completed:** 2013

Location: Stowe, Vt. **Designers:** Andrea and Brian Hamor

Builder: Skyline Building Co., Richmond, Vt.

space and relocating the powder room improved the flow; adding a pantry supplied plenty of storage. On the second floor, we added dormers to the existing house and designed a second-floor master suite in the space between the original house and the garage. The suite includes a large bathroom toward the front, a walk-in closet in the middle, and a bedroom at the back of the house that aligns with the best views. We filled in the space below the master bedroom with a laundry room and a yoga studio where an old three-season porch had been. In front of this, we placed the powder room and added a generous mudroom.

While attending architecture school, I worked in the building trades. Taping and painting high-end homes, I was responsible for the final finish to walls, ceilings, and trim. Out of this experience, I formulated an aesthetic that is simple yet elegant. Overall, my approach is to showcase a home as a whole instead of as a collection of pieces (see "Simple, no-fuss detailing," facing page).

Stripping away the unnecessary pieces—such as overwrought timber framing or stonework veneer—allows the architecture itself to be revealed and less to become more. It's not a matter of rejecting embellishment entirely, but reinventing it in a manner that is appropriate to the place and to the people who reside there. □

Brian Hamor (hamorarchitecture.com) practices architecture in Stowe, Vt. Photos by Susan Teare, except where noted.

Designing for

An updated HUD guide demonstrates that a durable house is also a dry house

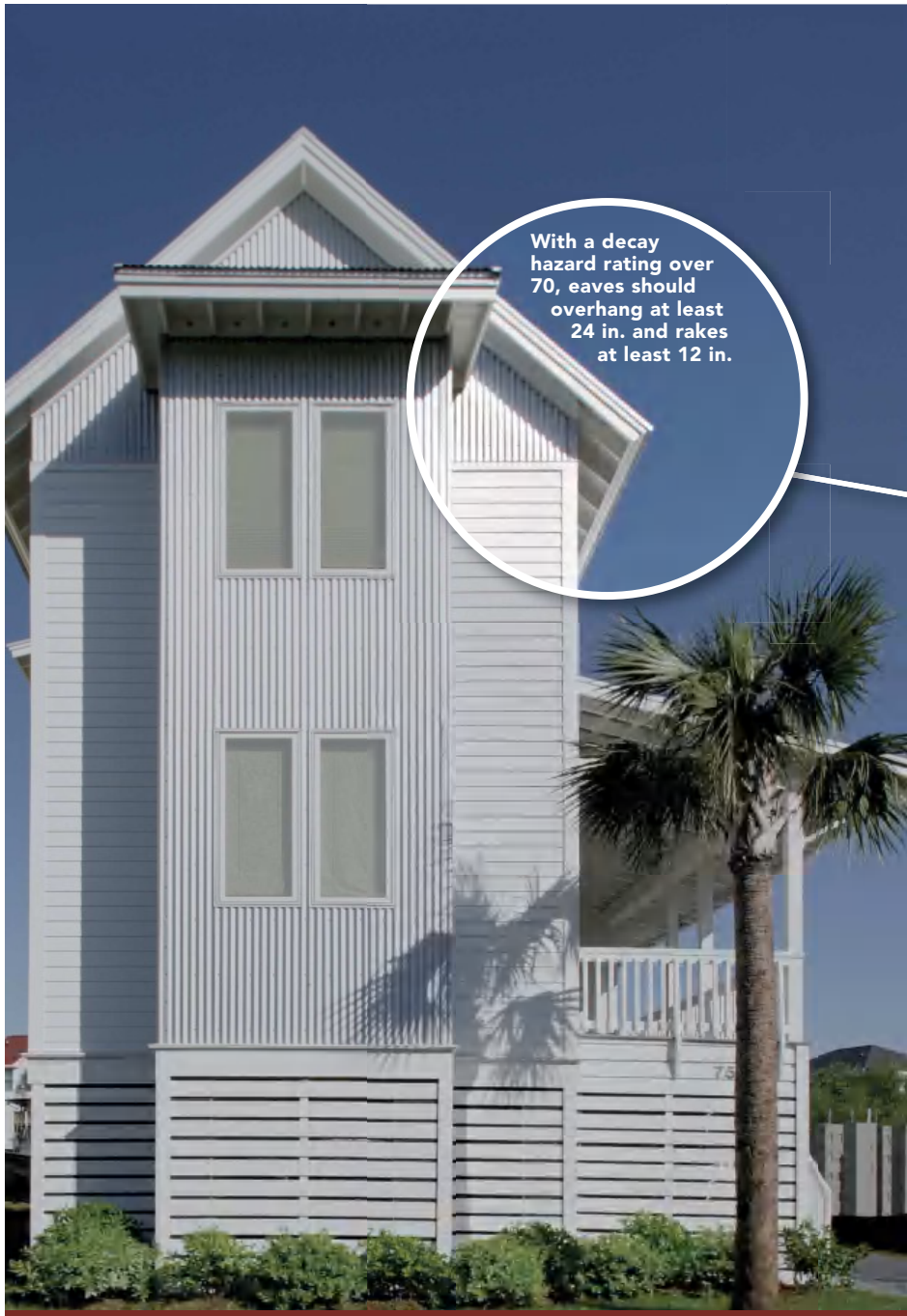
BY JAY CRANDELL AND JAMIE LYONS

Have you Googled "housing durability" lately? Probably not. But you might be surprised that one of the most popular downloads on the U.S. Department of Housing and Urban Development's (HUD) website is a guide we were commissioned to write called *Durability by Design*. It's a collection of best design practices for housing durability from the ridge vent to the footings, and it covers moisture, UV radiation, corrosion, mechanicals, insects, and other topics. According to Dana Bres of HUD, who was instrumental in creating both the original guide and its recent update, one reason it's been so popular is that "the practices which make for good durability are often the same ones that make houses more sustainable and efficient. In searching for those details, builders and designers find us."

It struck us that the original 2002 publication is kind of like a time capsule that shows the building methods and materials commonly used in that era. "Era" makes it sound long ago, but homes really do work a lot differently today than they did a decade ago, and this affects durability. We've seen these changes along the way through our work in building consulting, training, research, inspections, and forensics, but updating this 12-year-old durability guide really put the changes into focus for us.

Here we highlight some of the most important topics in the new version of the guide. We hope you'll give the new guide a read and find it as interesting as we did in producing it. □

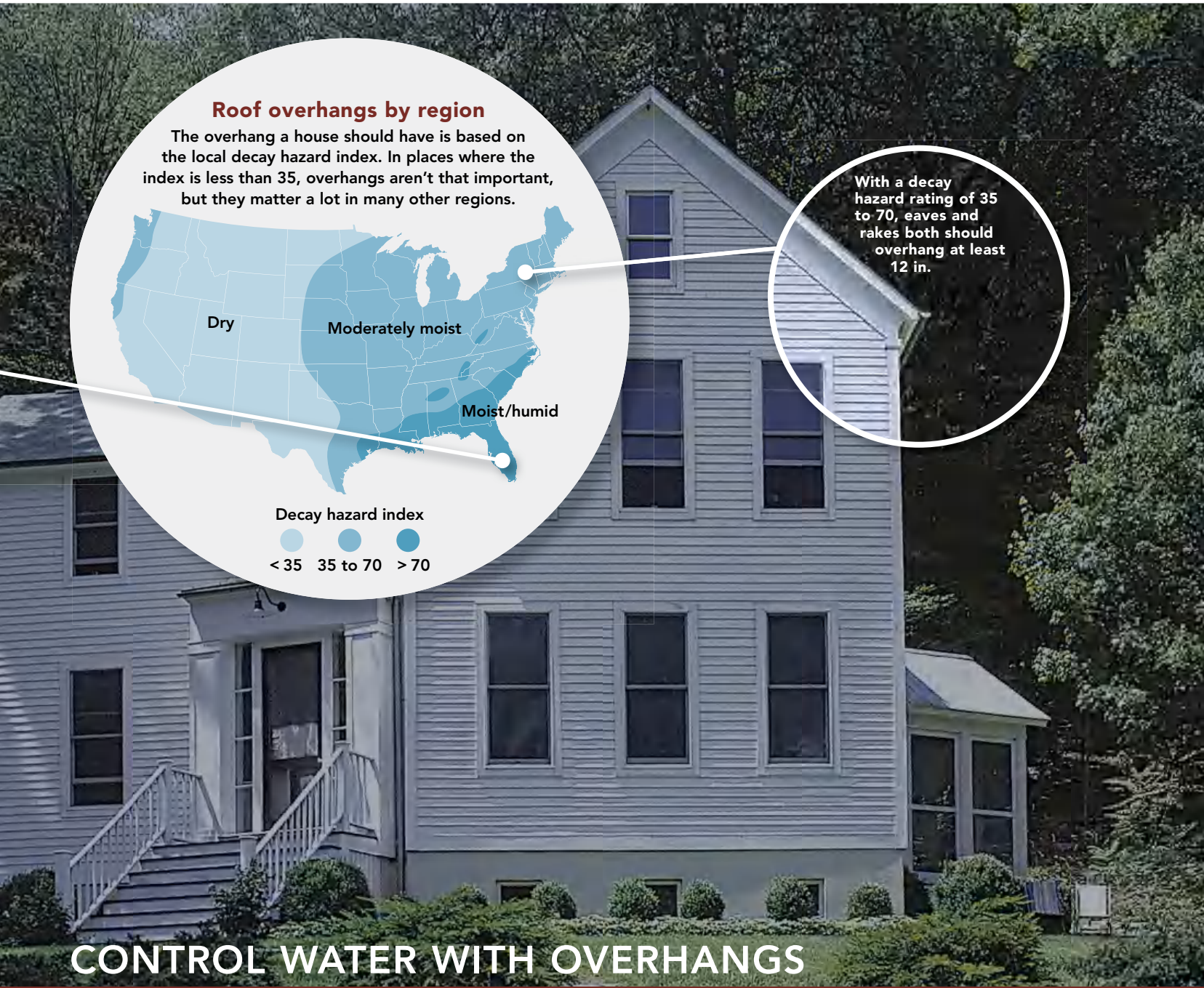
Jay Crandell, P.E., and Jamie Lyons, P.E., are engineers specializing in residential durability and energy. They are the co-authors of HUD's *Durability by Design*.



ONLINE EXTRA To download a PDF of the new *Durability by Design* guide, visit newportpartnersllc.com.

Photo this page: Sara Cook. Photo facing page: Ken Gutmaker.

Durability



CONTROL WATER WITH OVERHANGS

Rainwater control has always topped the list of durability-fostering details. The improved insulation and air-sealing of today's exterior walls means that they have a greater sensitivity to moisture. Keeping rain from hitting walls, which is the job of roof overhangs, is more important than ever. In the revised guide, we place the important factors for rainwater management into a clear decision-making framework that includes recommendations for roof-overhang width based on risk of decay—which differs by region—as a way to reduce the risk of water intrusion in walls.

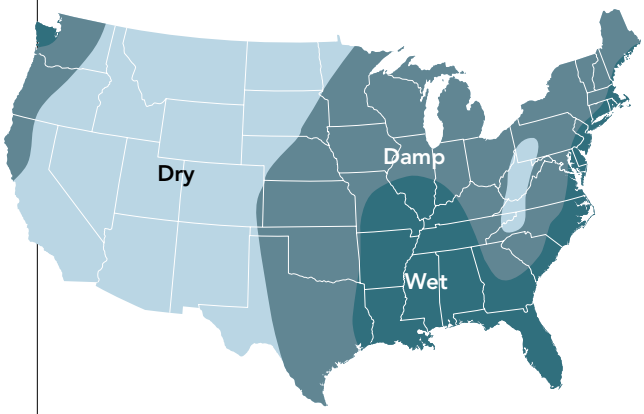
DESIGN WALLS BASED ON LOCAL RAINFALL

Although a wall's durability and performance depend on far more than its exterior cladding, the design and installation of that cladding and its underlayment are critical factors in protecting a building from rainwater and moisture accumulation. The revised guide lays out a three-step procedure for selecting a durable and climate-appropriate method of constructing exterior walls to ensure performance in specific climates.

STEP 1

ASSESS THE SITE'S CLIMATE

Begin by categorizing the climate based on the potential for wetting of walls, especially wetting from wind-driven rain. These classifications are a bit subjective, as there aren't clearly defined criteria in the United States for assessing the effects of wind-driven rain. As a proxy, we use a wind-driven-rain map in the revised guide to help classify the severity of the climate.



STEP 2

ASSESS BUILDING EXPOSURE

The terrain surrounding a building affects its exposure to wind-driven rain, as does the ratio of roof overhang to the height of the wall below. Increased shielding of the site against wind tends to reduce the effects of rain. Similarly, wide roof overhangs relative to wall height effectively reduce the exposure.

Reference the table at right to determine a building's exposure level based on the climate, the roof-overhang ratio, and the wind. The exposure level provides a basis for selecting an appropriate exterior-wall assembly. We can drill down further by applying the exposure levels in the table to specific walls of a house or even elements such as glazing. By understanding the exposure at this simplified level, a builder or designer can make decisions about flashing details or consider the benefits of using wider overhangs.

BUILDING EXPOSURE LEVELS

Wind exposure	Overhang ratio*	Site climate		
		Wet	Damp	Dry
Little or no wind protection from surrounding buildings and/or natural obstructions	0	High	High	Moderate
	0.1	High	Moderate	Low
	0.2	Moderate	Low	Low
	0.3	Moderate	Low	Negligible
	0.4	Low	Low	Negligible
	≥ 0.5	Low	Negligible	Negligible
Wind protection from surrounding buildings and/or natural obstructions	0	High	High	Moderate
	0.1	High	Moderate	Low
	0.2	Moderate	Low	Negligible
	0.3	Low	Negligible	Negligible
	0.4	Low	Negligible	Negligible
	≥ 0.5	Negligible	Negligible	Negligible

*Find the overhang ratio by dividing the roof overhang by the wall height.

Photo: Charles Bickford. Drawings facing page: Christopher Mills.

STEP 3

SELECT A WALL ASSEMBLY

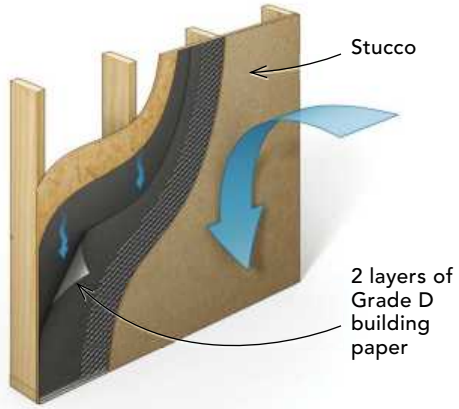
Based on the building exposure level determined in step 2, use the table at right to select an appropriate exterior-wall assembly. With a reasonable level of installation quality and maintenance, a wall rated "good" has a low risk of failure during its likely service life. A "fair" wall may require more careful attention to detailing, installation quality, and maintenance, and it has a tolerable risk of failure during the likely service life. "Not recommended" means that the wall shouldn't be used on a wood-framed house in that climate.

RELATIVE PERFORMANCE OF EXTERIOR-WALL ASSEMBLIES

Exposure level	Concealed barrier	Drained cavity	Basic rain screen
High	Not recommended	Fair	Good
Moderate	Fair	Good	Good
Low	Good	Good	Good
Negligible	Good	Good	Good

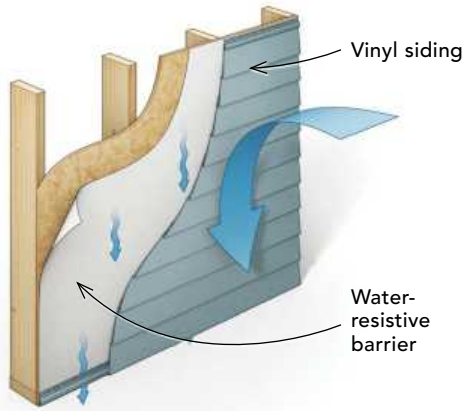
Concealed barrier

The concealed-barrier method relies on porous cladding material adhered to or placed directly on an internal water barrier or drainage plane. A common example is conventional stucco applied over two layers of Grade D building paper. This method relies primarily on deflection of rainwater, but it also has some ability to absorb and retain moisture, which can dry out later. These walls allow water to seep out through weeps at the bottom, but there is no open pathway to allow water to drain freely. Also, moisture stored in the cladding from a recent rain can be driven into the wall by the sun as vapor, especially when the wall uses a vapor-permeable water-resistive barrier (WRB) material such as building paper and many housewraps. Synthetic stone is another example of a concealed-barrier cladding.



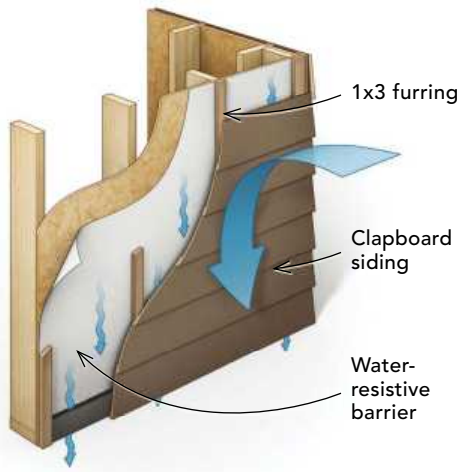
Drained cavity

Drained cavities increase the life of exterior finishes on wood surfaces by promoting drying. The method relies on deflection, drainage, and drying to protect the wall from moisture damage. In general, a cavity separates the cladding from the surface of the underlying WRB. A minimum cavity depth of ⅜ in. is often recommended, but this may vary. While wood siding might be nailed over spacers to create such cavities, vinyl siding placed directly on the WRB creates a cavity whose continuity is broken at points of contact, and masonry veneer is laid with a minimum 1-in. cavity depth to allow space for drainage as well as placement and mortar excesses. The drained-cavity approach also can be applied to portland-cement stucco with use of a drainage mat or metal lath placed over spacers to create the cavity.



Basic rain screen

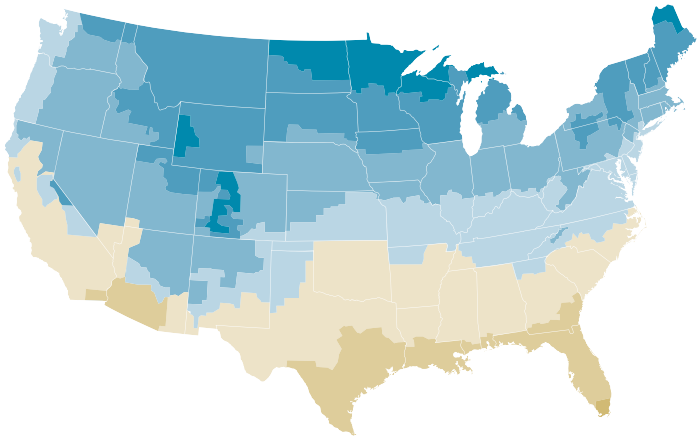
A rain screen is similar to the drained-cavity method, but it has added features to reduce air-pressure differentials across the cladding system that can occur during wind-driven rain. Pressure differentials can draw water into the drainage cavity. At a minimum, this approach uses a rigid air barrier such as sheathing behind the cladding that is able to resist wind pressures. This reduces wind pressure across the cladding (which is not airtight) and is less likely to result in water being sucked behind the cladding. Also, the cavity between the cladding and the water/air barrier must be compartmentalized by use of airtight blocking or furring at corners of the building. This feature prevents water from being sucked into the cavity due to a pressure difference on an adjacent wall. Although the rain-screen method offers improved performance, the simpler drained-cavity method is usually considered a more practical alternative for typical home-building applications.



INSULATE WALLS TO AVOID CONDENSATION

Preventing water vapor from condensing into liquid in walls is incredibly important for durability. Recently added to the International Energy Conservation Code (IECC), continuous rigid exterior insulation combined with traditional batt or blown cavity insulation is detailed as an option for many climate zones. This change can affect how moisture in walls behaves in ways that the code did not seem to anticipate.

We can prevent condensation in walls by keeping the interior of their sheathing from falling below the dew-point temperature. In the prescriptive wall assemblies, the continuous exterior insulation must hold enough heat in, or the cavity insulation must let enough heat through, to keep the sheathing interiors warmer than the dew point. Durability requires a climate-specific look at the ratio between the R-values of the exterior insulation and the cavity insulation, as well as the permeance of the vapor retarder.



Minimum insulation ratios for U.S. climate zones

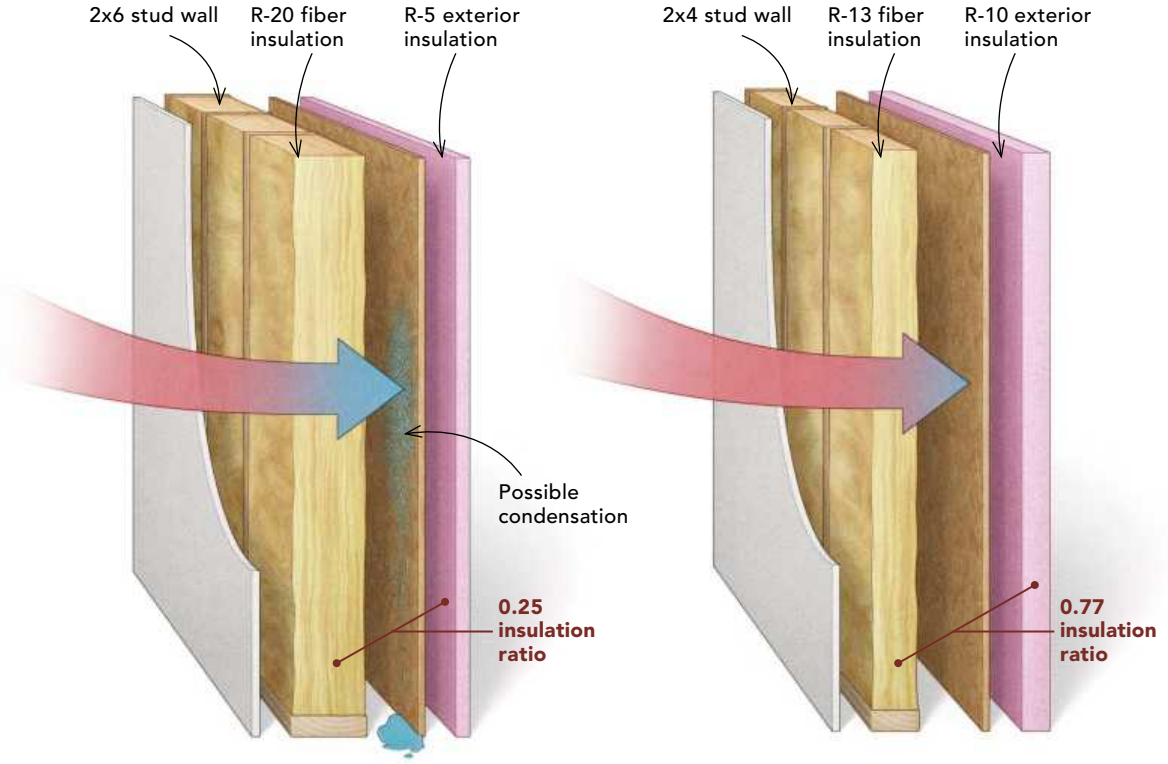
Climate zone	Class II interior vapor retarder	Class III interior vapor retarder
1 to 3	No limit	
4	0.2	
5	0.2	0.35
6	0.25	0.5
7	0.35	0.7

MATCH THE INSULATION TO THE VAPOR RETARDER

The insulation ratio is the R-value of the exterior insulation divided by that of the cavity insulation. For example, R-5 (1 in. rigid foam) ÷ R-20 (6 in. fiber insulation) = 0.25. Used with low-perm exterior foam insulation, Class I vapor retarders such as plastic can trap moisture. Class II (kraft-paper-faced batts) or Class III vapor retarders (many paints) allow drying to the inside. Using the map and the chart above, match the type of vapor retarder to the insulation ratio and the climate zone to avoid condensation.

THINK BEYOND THE BUILDING CODE

Both the walls below meet code, but one might have condensation in a cold climate. One option in the 2012 IECC for all climate zones is an R-20+5 wall. However, its insulation ratio of 0.25 can cause condensation in zones 5 and up if used with a Class III vapor retarder. The IECC considers an R-13+10 2x4 wall to be thermally equivalent to an R-20+5 wall. With an insulation ratio of 0.77, this wall should perform well up to zone 7 with a Class II or Class III vapor retarder.



Bottom drawings: Christopher Mills

Today's Best Exterior Trim

A veteran carpenter sorts through 10 of the latest engineered options

BY GARY M. KATZ

Not too long ago, the only material used for exterior trim was old-growth lumber—Douglas fir and redwood on the West Coast; yellow pine, white pine, and cedar on the East Coast; southern yellow pine and cypress in the South. Because of changes in forestry and the introduction of innovative materials, home builders and homeowners today have a host of trim products to choose from. All of these engineered-trim options promise to be decay resistant and easy to work with and to perform better than the new-growth lumber stocked at the lumberyard. However, each has its own unique properties that you need to understand before using it in the field.

I first wrote about engineered trim 10 years ago for *Fine Homebuilding,* and a lot has changed since then. Many of the products I reviewed in that story are no longer available, while many others have changed so much that they no longer resemble the originals. It's time to take a fresh look at modern exterior trim in order to help you choose the right product for your next project.

Gary M. Katz is a contributing editor.
Photos by Rodney Diaz, except where noted.

Photo: Charles Bickford

SIDE BY SIDE

EXTERIOR TRIM AT A GLANCE

ACETYLATED

A process using acetic acid (concentrated vinegar) changes the wood fibers in the various species that are used so that their cells can no longer absorb moisture. This makes the wood dimensionally stable and indigestible, so it holds paint better and is more resistant to rot and insects. Unfortunately, acetylated wood is expensive, and availability is limited. Although the manufacturer says the smell dissipates, you may have to endure a strong odor if you have a lot of trim to install. The biggest benefit of Accoya is that it looks and handles like regular lumber.

CELLULAR PVC (free foam)

Most cellular-PVC trim is made using the so-called free-foam process, in which the material cools slowly as it leaves the injection die. Free-foam PVC is consistent throughout its thickness, and the inner core is smooth and has the same density as the outer skin. To minimize expansion caused by solar heating, PVC trim should be painted either with a light-colored conventional paint with a light-reflectance value (LRV) of 55 or greater, or with a light-reflecting paint with an LRV of 40 or greater. Free-foam PVC should be securely fastened with screws and PVC-compatible construction adhesive. Joints should be glued with PVC cement.

CELLULAR PVC (celuka)

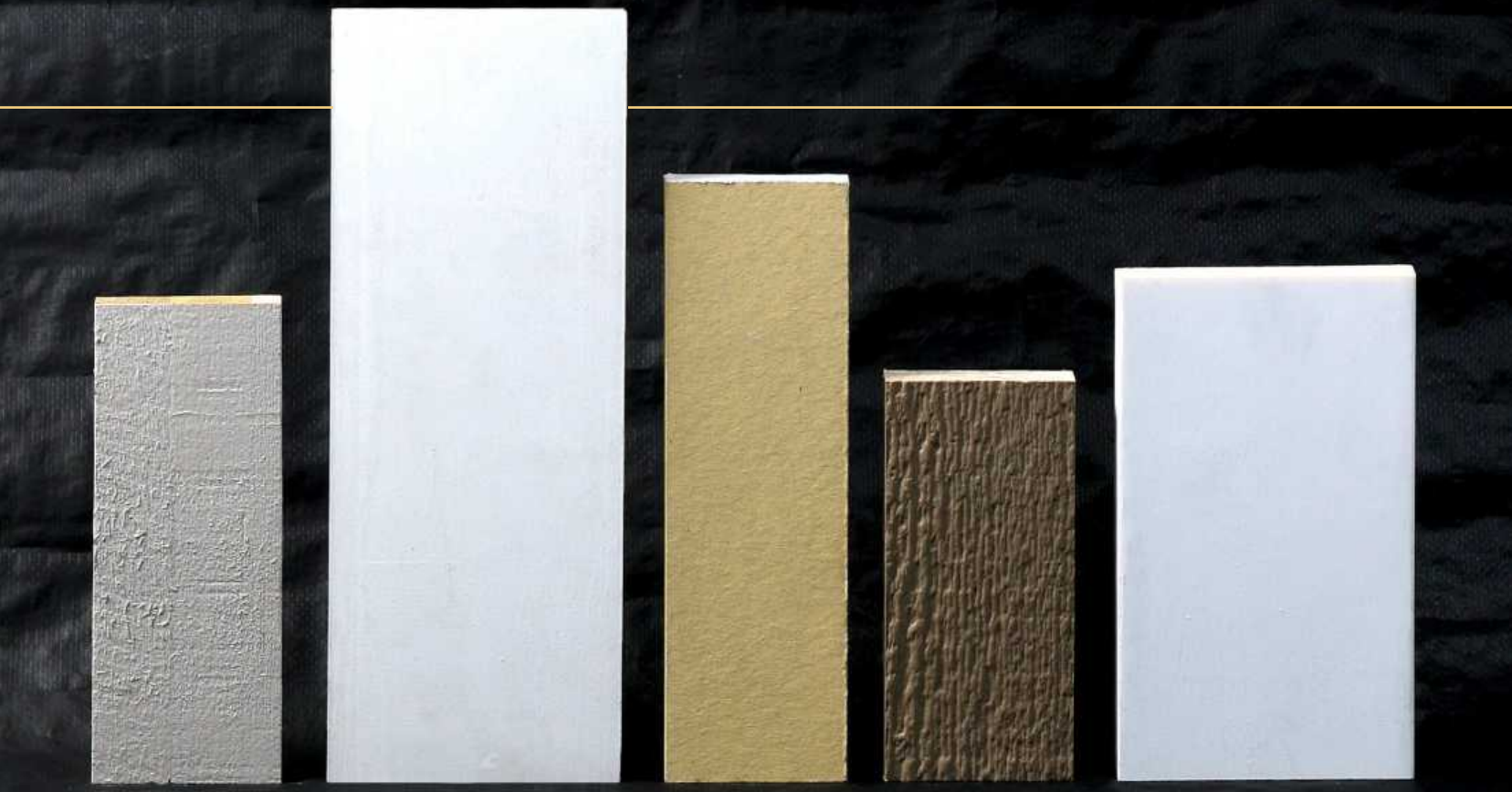
As celuka PVC leaves the injection die, water cools the expanding foam, creating a PVC trimboard with a dense outer skin and a more granulated core. The manufacturer claims that this makes celuka PVC more dimensionally stable and more impact resistant than free-foam PVC. But because the core has a rough texture, celuka trim must be thoroughly sanded if the edges are profiled. Like free-foam PVC, celuka PVC is best fastened with screws and PVC-compatible construction adhesive. Joints are glued with PVC cement. When installing both types of PVC in cold weather (40°F or colder), leave 3⁄16-in. gaps at joints for warm-weather expansion.

COMPOSITE

MiraTEC is made from northern hardwood fibers collected from other milling operations and mixed with adhesive resins. The company adds a zinc-borate treatment for rot and insect resistance, and then the material is compressed under ultrahigh pressure, much like how OSB is made. But compared to OSB, the wood fibers that make up MiraTEC are far smaller, so you can create edge profiles and route patterns into the boards using standard woodworking machinery with carbide blades and bits. As with other wood-based products, miters are not recommended because seasonal changes in humidity cause them to open up over time.

FIBER CEMENT

Fiber-cement trimboards are made from a lower-density formulation of the same materials that make up fiber-cement siding (sand, cement, and cellulose fibers). Over the last 10 years, fiber-cement products have changed radically. New additives have reduced moisture absorption, and the addition of fiberglass has improved strength and durability. Fiber-cement boards cannot be routed or shaped, and they must be cut with carbide-tipped blades. Personal protective equipment and dust collection are a must because of the risks associated with breathing silica dust. Fiber-cement trim such as James Hardie's Color Plus provides a durable finish and eliminates on-site painting.



FINGER JOINTED

Finger-jointed boards are straight and free of knots as well as the coffee-colored stains caused by them. To get wider boards, some finger-jointed stock is also edge-glued. Finger-jointed exterior trim is made from eastern white pine, cedar, and imported radiata pine. For appearance, convenience, and dimensional stability, finger-jointed exterior trim is almost always coated with primer. The quality of the priming varies greatly from manufacturer to manufacturer. Look for boards manufactured with a thick coat of primer that sufficiently masks the finger joints. One example, Fortress FJ from Russin Lumber (made from western red cedar), undergoes a multistep priming process.

FINGER JOINTED (treated)

Some finger-jointed trim includes organic-based treatments to protect the wood from insects and rot. These treatments also reduce the amount of moisture the wood can absorb, though not as effectively as acetylation. However, treated finger-jointed boards are much less expensive than acetylated stock. Like untreated finger-jointed stock, treated finger-jointed boards such as those from WindsorONE are easily shaped and routed on the job site with ordinary woodworking tools. As with other wood-based trim products, you should avoid exterior miters because seasonal wood movement causes them to open.

FLY ASH

The most recent engineered-trim option is made from resin and fly ash, a waste product of coal-generated electricity. According to Boral, currently the only manufacturer of fly-ash trim, its TruExterior trimboard doesn't absorb moisture and has no thermal expansion. Fly-ash trim is also impervious to insects and rot. TruExterior is cut and edge-profiled with standard woodworking tools and can be painted with any exterior-rated coating. The manufacturer claims that sawdust generated from cutting or milling fly-ash trim is no more carcinogenic than wood sawdust, and the fly ash used for making the boards is tested thoroughly for harmful contaminants.

OSB

LP is currently the only producer of trim made from OSB. Its SmartSide trimboards are made from compressed wood fibers and resin and are wrapped with a textured overlay that gives the boards the appearance of solid lumber, provides protection from the elements, and improves paint adhesion. The manufacturer further protects the boards with zinc borate, which improves its resistance to moisture, insects, and rot. OSB is one of the most affordable types of exterior trim, but it can't be routed or shaped like wood. In addition, OSB can't be mitered or laminated, and it is susceptible to swelling caused by moisture.

POLYURETHANE

Decorative architectural elements such as pediments, gable louvers, brackets, finials, and medallions made from polyurethane are common in residential construction. However, polyurethane boards aren't nearly as common because the material is more expensive than other options and is easily damaged by impact. Polyurethane expands and contracts less than other plastic-based options, and it has a smooth surface and crisp edges that make it a convincing stand-in for wood trim. Polyurethane trim is first bedded in polyurethane adhesive and then fastened with corrosion-resistant fasteners.

HOW MODERN EXTERIOR TRIM STACKS UP

Trim type	Brand examples	Description	Warranty	Cost of 1x4x16	Cutting and milling
Acetylated	Accoya	Natural wood treated with acetic acid	50-year limited (above ground); 25-year limited (ground contact)	$60	Machines and routs well with a little fuzzing using standard carbide tools. Dust collection is beneficial.
Cellular PVC (free foam)	Azek, Kleer Versatex	Free-foam cellular PVC	Azek, 25-year limited; Kleer, lifetime limited on product, two years on labor; Versatex, 30-year limited	$26	Machines and routs very well with standard carbide tools. Dust collection is beneficial.
Cellular PVC (celuka)	Koma	Water-cooled cellular PVC	25-year limited	$26	Cuts with standard carbide tools, but machined edges are rough. Dust collection is beneficial.
Composite	MiraTEC	Compressed hardwood fibers protected with borate-based preservative	50-year limited	$15	Machines and routs well using standard carbide tools. Dust collection is beneficial.
Fiber cement	HardieTrim, CertainTeed Trimboards	Primed fiber cement with additives for reducing moisture absorption and improving strength	15-year limited	$19	Cuts with specialty carbide tools. Must use dust collection.
Finger jointed	Fortress FJ	Finger-jointed primed western red cedar	15-year limited with one factory coat of Benjamin Moore primer; 25-year limited with two factory coats	$20, $25	Machines and routs well with a little fuzzing using standard carbide tools. Dust collection is beneficial.
Finger jointed (treated)	WindsorONE, Bodyguard	Edge-glued and finger-jointed radiata pine protected with borate-based preservative	30-year limited	$17	Machines and routs well with a little fuzzing using standard carbide tools. Dust collection is beneficial.
Fly ash	Boral TruExterior	Fly ash and adhesive with fiberglass reinforcement	20-year limited	$22	Machines and routs very well using standard carbide tools. Must use dust collection.
OSB	LP Smartside Trim	Compressed wood strands protected with zinc-borate preservative	Five-year 100% on material and labor; 50-year prorated	$13	Cuts with standard carbide tools but does not rout or machine. Rips must be sealed. Dust collection is benefical.
Polyurethane	Fypon	Polyurethane foam with primer	Lifetime limited	$23	Cuts with standard tools but does not rout or machine. End cuts and exposed interior turn yellow if left unprimed.

Best uses	Movement	Prohibitions and warnings	Fastening requirements	Finishing requirements	Job-site storage
High-visibility projects where unpainted natural wood is part of the design and is on display	Moves 80% less than nonacetylated wood of the same species	Use with stainless-steel flashing. Keep 6 in. above grade and 2 in. above roofing materials.	Stainless-steel nails or screws only. Use the same nailing pattern as with untreated wood.	Seal end cuts with exterior primer or clear sealer.	Elevate and protect from weather.
Ideal for close-to-grade applications. Good for trim that requires custom edge treatment or milling.	Expands in length with temperature. Securely fasten to restrict movement and prevent buckling.	Leave a 3⁄16-in. gap at butt joints with temperatures up to 40˚F and a 1⁄16-in. gap at temperatures from 80˚F to 100˚F.	8d stainless ring-shank nails or screws. Use PVC cement for gluing joints. Use PVC-compatible adhesive to bond PVC to wood.	100% acrylic paint with a urethane additive and medium to high LRV (over 55%)	Store out of direct sun, and keep at ambient temperature during installation.
Ideal for close-to-grade applications but not edge profiling. More impact resistant than free-foam PVC.	Expands in length with temperature. Securely fasten to restrict movement and prevent buckling.	Leave a 3⁄16-in. gap at butt joints with temperatures up to 40˚F and a 1⁄16-in. gap at temperatures from 80˚F to 100˚F.	8d stainless ring-shank nails or screws. Use PVC cement for gluing joints. Use PVC-compatible adhesive to bond PVC to wood.	100% acrylic paint with a urethane additive and medium to high LRV (over 55%)	Store out of direct sun, and keep at ambient temperature during installation.
Avoid close-to-grade locations and areas subject to regular wetting.	Minimal expansion	Keep 6 in. above grade, 1 in. above roofing materials, ½ in. above concrete, and ¼ in. above flashings.	6d or 8d 16-ga. corrosion-resistant finish nails or headed nails. Nails must penetrate 1¼ in. into framing. Bond with waterproof wood glue.	Prime end cuts, then coat with high-quality oil or acrylic-latex primer. Paint with acrylic latex.	Elevate and protect from weather.
Impervious to insect damage. Unaffected by heat and direct sun.	Minimal expansion	Maintain ¼-in. space between wall flashing and siding materials and 2-in. space above decks, paths, steps, driveways, and roofs.	Stainless-steel finish nails (except for fascia installations without subfascia, which should be nailed directly to rafter ends with 6d siding nails)	Don't use stain or oil- or alkyd-based paint. 100% acrylic topcoats are recommended.	Elevate and protect from weather.
Minimal exposure to rain or splashback. Good for custom dimensions and profiles.	1% increase across the grain for every 4% increase in moisture content	Keep 8 in. above grade and 2 in. above decks and roofs.	Don't use finish nails. Use ring-shank or splitless stainless-steel or HDG siding nails or screws. Countersunk nails must be sealed and filled.	Prime all field cuts. Apply two coats of 100% acrylic solid-color stain or paint.	Elevate and protect from weather.
Greater exposure to water and insects than untreated. Good for custom dimensions and profiles.	1% increase across the grain for every 4% increase in moisture content	Do not use for railings or trellises. Moisture content must be below 18%. Keep 8 in. above grade and 2 in. above decks and roofs.	Don't use finish nails. Use ring-shank or splitless stainless-steel or HDG siding nails or screws. Countersunk nails must be sealed and filled.	Prime all field cuts. Apply two coats of 100% acrylic-latex exterior paint.	Elevate and protect from weather.
Ideal for close-to-grade applications	Minimal expansion	Approved for ground contact	Stainless-steel or galvanized finish nails 24 in. on center	Oil or latex paint	Keep level and protected from weather.
Projects with tight budgets. Cut edges should be hidden, as they look unfinished.	Minimal expansion	Leave a 3⁄16-in. gap between other materials and at joints for sealing. Leave a similar gap between siding, windows, and doors.	8d HDG siding nails 24 in. on center. Maintain 1-in. penetration into framing. Countersinking requires sealant and possible additional nailing.	Use high-quality acrylic-latex paint. Semigloss or satin oil or alkyd paints are also acceptable.	Elevate and protect from weather.
Avoid locations where it will be damaged by string trimmers or impact.	Allow 3⁄16 in. per 18 ft. for expansion and contraction.	Avoid high heat, and allow material to acclimate to ambient temperature before installation.	Bed material in a bead of polyurethane adhesive, and use corrosion-resistant nails and screws. Use polyurethane adhesive on all joints.	Fill large holes with auto-body filler. Fill small holes with exterior spackle. Paint with acrylic-latex.	Store on a flat, level surface in a cool area out of extreme heat.

Enhance Your Life With an Outdoor Shower

After a weekend of plumbing, site work, and carpentry, you can wash up in your handiwork

BY BRIAN PONTOLILO

For the minimalist. *This shower is as simple as it gets. The fixtures are mounted to a cedar board set into the shingled wall. Decorative gravel enhances drainage, and a few well-placed stones provide a natural surface for standing. For this design, a bathing suit or private yard is required.*

After four years of remodeling my house, I'm starting to tackle the punch list. It's easy to look back and criticize my decisions, to wonder what I might do differently if I ever remodel a house again. One thing I'm certain I would not change is my outdoor shower. This project cost under $1000—which could have been less had I done the plumbing myself—and added invaluable convenience and joy to my life. When I'm covered in dirt after a long day of work, I can now leave it all outside. And walking out to shower in the morning, where I can hear songbirds and watch the sun rise, sets the right tone for my day. Here's what you need to know to get the plumbing and site work right, as well as some inspiration for your own outdoor shower. □

Consulting editor Brian Pontolilo showered outside this morning.

A window to the ocean. *This cedar surround provides plenty of privac the designer framed a view of the in the distance. The rafters above style but still allow plenty of sunlig moonlight to illuminate the shower. The spaced ipé decking lets water drain to a bed of gravel below.*

SURROUNDED BY STYLE

Captured on all sides by sandy beaches, and inhabited largely by vacationers, Cape Cod and Martha's Vineyard have a high ratio of outdoor showers to households. Mark Hutker, FAIA, an architect with offices on the Vineyard and the Cape, has been designing outdoor showers as part of his homes for decades. His projects (shown here) are not only inspired, but they offer practical lessons.

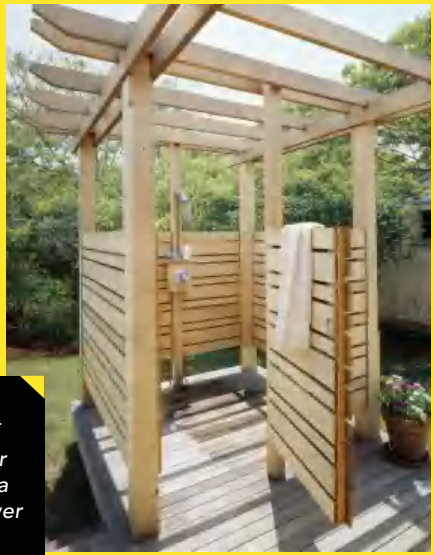
If the shower is to be placed against the house, Mark recommends a sunlit location and avoiding the house's inside corners. This will provide plenty of open air around the shower for drying and minimize how much of the house gets wet.

Next, consider the view from the shower. You may plan the shower to expose an open view to the natural landscape, a framed view of gardens, or a vast view to the sky. You may want to include some light for showering at night or e the morning, but Mark sug placing the lighting too clo shower because it will attra

Choose durable materials keep in mind that even the weather-resistant materials patina faster and potential than expected if the showe frequently. Include shelves conveniences to hold sham combs, soap, towels, and t

Shower flooring can be w (ipé and mahogany are Ma favorites), stone, or anothe rot-resistant material such or synthetic decking. While suggests avoiding fir or pr treated material for floorin they splinter, PT is a good structural elements.

Remember that while the may be used only for a few of the year, it will be part c landscape year-round. Fina Mark, "because you will be naked outside, it's worth taking the time to build something that you will feel comfortable in."



Pergola on deck. *Away from the house, this shower provides privacy within the context of a pergola. Hot and cold supply lines run under the deck, and the mixing valve is captured in a simple box that also provides a shelf for shower necessities.*

PLUMBING ESSENTIALS

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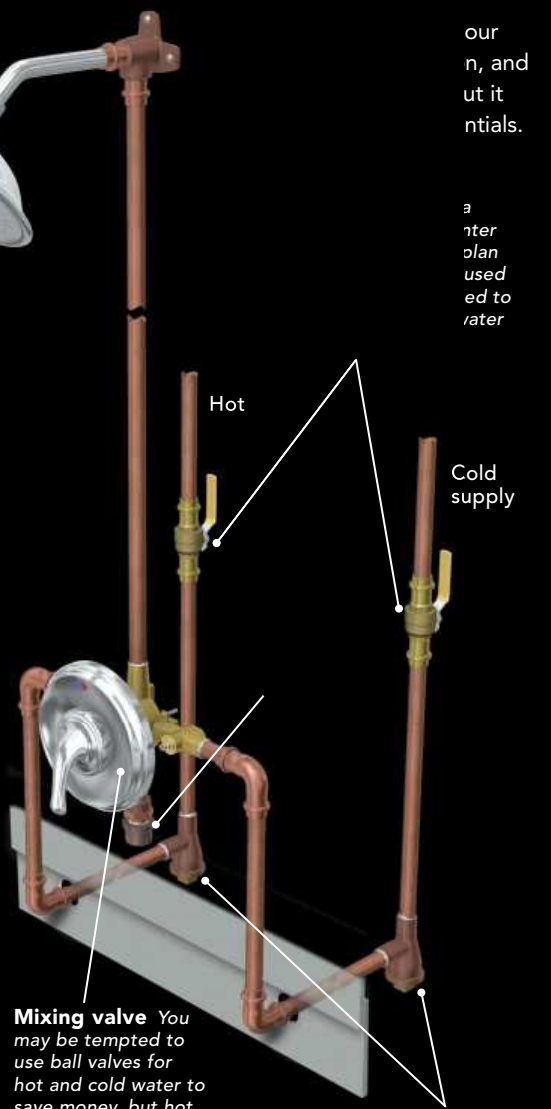


Mixing valve *You may be tempted to use ball valves for hot and cold water to save money, but hot water is dangerous, and a proper thermostatic mixing valve includes scald protection and may be required by code.*

Drains *Water sitting in pipes can cause damage during freeze-thaw cycles. It's important to be able to drain the lines. Here, Ts with threaded plugs are used.*

Gray water *Drainage is important, even if it's just to prevent water from pooling at your feet. A few inches of gravel might be all that's needed. If the house or basement is at risk of getting wet from the runoff, consider adding an underground gutter (shown) or a French drain that leads to daylight. Some jurisdictions require that you capture your gray water and direct it to a sewer or a septic tank.*

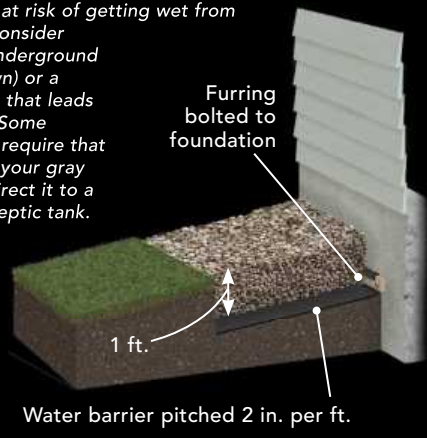


Photo facing page and top photo this page: courtesy of Hutker Architects. Bottom photo this page: Brian Vanden Brink. Drawings: Toby Welles, WowHouse.

Ten Tips

Improve the speed and quality of your next trim job with better layout, assembly, and installation

BY JOE MILICIA

Perhaps nowhere does the old saying that time is money ring truer than in carpentry. To stay in business, I need to work quickly, and I need to do so while maintaining a high standard of quality. For instance, if I only have a couple of days to complete a crown-molding installation and I end up spending 40% of my time making extra trips up and down ladders or hunting for materials, I'm not only cutting into my earnings, but I'm spending far less time cutting and fitting joints precisely.

That's why any professional who installs trim will benefit from a production approach that eliminates wasted time while bolstering accuracy. While whole books have been published about the production approach, I've boiled down my method to 10 essential tips that every trim-installation job can benefit from. Even if you don't make your living as a carpenter, these select strategies will help you to create a better-looking job that allows you to move on to other projects faster.

Admittedly, no two trim jobs are the same, and no two carpenters are either. What saves time for one person may make another person develop a sore back, and different materials sometimes demand an adjusted workflow. The tips here are an organizational starting point

1 Increase efficiency with a dedicated production area

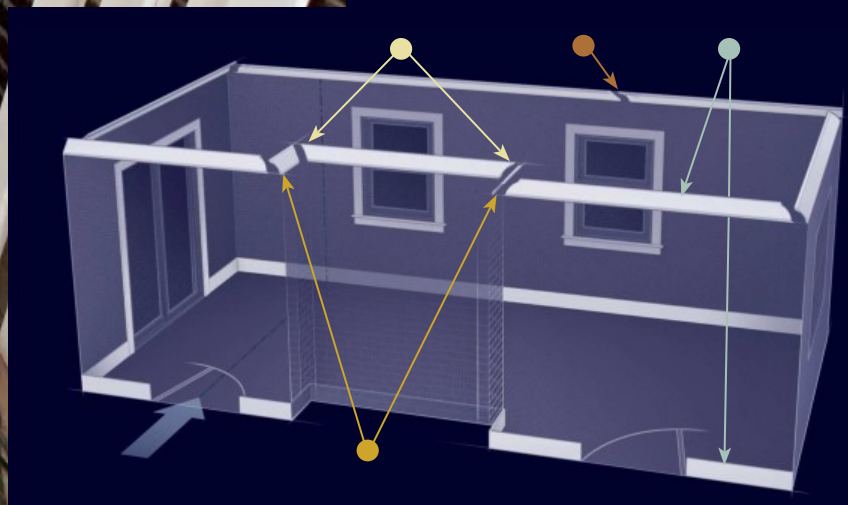
In a production area such as this, you can mill and assemble window trim while at the same time organizing rough cuts of base moldings that will eventually be coped and cut to final length. Despite its small space, this cut room and assembly setup creates a workflow where neither work areas nor carpenters create a bottleneck.

Drawing: Christopher Mills

for Fast Trim

Visualize a plan of attack

2 To make your cutlists, always begin with a visual layout of each room. Walk each room and take an accurate count of trim lengths to minimize the splices in crown and base trim and to make sure that the splices are put in the least conspicuous spots and on the flattest surfaces of the room. Move around each room from left to right, numbering each board on the cut-list and marking it if it is a left or right cope. Being consistent in measuring each room is important, as it ensures that you don't miss any sections. Use this cut-list to rough-cut the trim. If some of the boards have knots in the middle, use them for the shorter pieces. This ensures that the best long boards remain intact for the longest runs.



Avoid coping short lengths of trim, as these are difficult to fit.

Start at the hardest spot—here, the outside miters with the short legs to the wall.

Locate crown splices out of sightlines and away from low spots in the ceiling, which are the most difficult places to get an even splice.

Measure rough cuts for crown and base at once. One carpenter can make short work of developing a rough-cut list by measuring the wall lengths and adding 3 in. for waste.

Windows require a large assembly table

3 Make your worktable large enough to fully support casing during assembly and glue-ups. A table that's too small won't provide enough support or an adequate clamping surface. By keeping a glue-brush jar full of water nearby (below), cleaning joints during casing assembly becomes second nature instead of a step that can be forgotten.

Don't be fussy when you don't have to be

4 Carefully cutting drywall for an outlet isn't necessary when the drywall will be covered by baseboard trim. Be sure, however, to locate the outlet so that when the shoe molding is added later, the outlet will appear centered on the baseboard.

and should be optimized to suit the way you work and to fit the work at hand.

Job preparation

The key to efficiency is creating good cutlists, a process that begins with a series of site assessments. At my company, we typically create a rough-cut list and a final list. Before the job starts, we take an inventory of the types and sizes of the windows and doors we have. We order trim specifically for each window and door size. This minimizes wasted time and ensures that we don't have splices on trim around windows and doors. Also to cut down on splices, we order the longest lengths of crown, baseboard, and shoe molding available.

If by a stroke of luck we are awarded a job at the framing stage, we stop by after the rough mechanicals are installed and take a few photos. These photos help to identify the location of nailing hazards such as wiring and pipes before they are hidden behind the insulation and drywall. We organize the photos by floor and eventually attach them to the cutlist as a reminder of potential trouble areas. When the drywall is installed, we can quickly make reference marks for these obstacles to prevent complications or delays in our trim installation.

For similar reasons, we check all the rooms for discrepancies, such as drywall that sticks proud of the window-jamb extensions, or low spots in the ceiling that will interfere with splices in the crown.

We make our assessments in the order in which we work, from the top of the house down and from the crown down in each room. This lets us begin the work without any finished flooring and allows other contractors to come in behind us as we complete each room.

Make cuts in two stages

We begin with a rough-cut phase in which we measure each trim piece, write its dimension on the drywall behind its intended location for future reference, then cut it about 3 in. long. We bundle rough-cut trim packages for each room together.

Rough-cutting adds an extra step to the job, but there are four very good reasons to do this with all of the trim. First, it allows us to prepare the trim in such a way that we can later cut out any knots or imperfections that would lead to callbacks. Second, it helps us to confirm that we ordered the right quantity of trim, as we can reference our cutlist while moving through the stack of material. Third, it gives us greater control over our use of the stock. For example, when we're installing door and window casing, we like to cut the miters at the middle of the trimboards rather than at the ends, which are more prone to snipe marks from milling and to checks. Finally, rough-cutting means that one carpenter can cut copes on one end of the crown, base, and shoe molding while another carpenter continues taking door and window measurements around the house. Cutting copes ahead of time, leaving the opposite end long, saves a lot of time when it comes to final cutting and installation.

Once the rough-cutting is done, we create a final cutlist to guide dimensioning the trim all the way through installation. A cutlist can be developed in many forms. Ours are not so much lists as they are attack plans (see p. 69). You can make a cutlist look like a checklist, a floor plan, or a combination of both.

Whatever its appearance, the final cutlist should include all the information you need for production. For large projects, we like to put the floor number first, followed by a number for each window and door. We start with the room to the left of the stairs and then

Create strong joints quickly

5 Biscuit miters for strength. But instead of marking the center of a biscuit to align the tool, register the biscuit joiner's edge to the tip of the miter to speed the process. Have enough miter clamps on hand (right) to reinforce each joint as the glue sets. Enough clamps for three windows keeps the production line moving without having to wait for glue to dry before assembling the next window.

Custom-fit stools to maintain quality

6 To maximize efficiency, remove the wallboard where necessary, and fit all the stools at once. Hold a section of casing in place to establish where the stool's mitered return intersects the casing's edge.

Reference marks help you stay organized

7 When fitting a trim component such as a window stool around the jamb, make a small tick to reference its ideal position. This saves time when fitting the dimensioned pieces later and ensures that the stool doesn't get installed in the wrong opening.

Use screws when needed

8 While finish nails satisfy most fastening tasks, certain components need to be pulled into place and demand the increased holding power that screws provide. On paint-grade trim, use trim-head screws, then fill the holes with putty and sand them flush.

work left to right. For example, door 301 would be the first door on the left of the third floor.

On most of our jobs, we create a cut room in a large, centrally located space to create some semblance of an assembly line. Ideally, the room can stay intact throughout the project. If large enough, the room also houses our glue-up worktable, where we assemble the door and window casings, and in some instances, even the built-up trim elements if the design calls for them.

With the cut room organized, begin the assembly

Whenever we can, we place the stock pile to the left of the cutting station, with the saw situated along one wall, and the opposite wall reserved for pieces that have been cut to length. This allows the cut man simply to turn around rather than being forced to walk around the length of the miter-saw stand. We set up another workstation to do all of our left and right copes. On the job pictured here, space was a little tight, so we used both the table and the wall to stage material.

After installing the crown, we move on to window and door trim before attacking the base and shoe. While we tackle nearly every job with this approach, we're careful never to pigeonhole ourselves into any given process. For example, on this job, we installed the flat casing on the windows and doors first and then went back and completed another cutlist for the backband. Sometimes trying to do everything ahead of time simply isn't as efficient as breaking up the process into more manageable chunks. Our crew has been working together for a while and falls into a natural rhythm, but we like to approach jobs with flexibility and always stay on the lookout for new efficiencies. □

Joe Milicia is the owner of Hobart Builders in Fairfield, Conn.
Photos by John Ross.

Clamp when you can

9 Look for opportunities to use clamps to hold trim in place. Here, double-hung sashes allow clamp placement where the carpenter would have a difficult time pushing the trim into place. Once the entire assembly is secured, the clamps are removed and the trim stays put, with a consistent reveal.

Don't cut corners for speed

10 Door casings require two trips to the saw. First, scribe and cut the side leg to the floor (inset below). Then mark the leg's length to maintain the proper reveal across the head casing (inset bottom). Finally, use two fastener sizes to secure the casing. For trim-to-trim connections, 18-ga. fasteners work well; 16-ga. fasteners secure the trim to the framing (below right).

Get the Most From Your Multitool

Even if you've had an oscillating tool for years, you may not be using it to its full potential

BY KEVIN IRETON

In 1943, Homer Stryker used the motor from a malted-milk machine to build the first oscillating electric saw. An orthopedic surgeon in Kalamazoo, Mich., Stryker was looking for a way to remove plaster casts quickly and safely. He received a patent on the saw in 1947. Why it took 50 years for this tool to reach the job site, I'll never know.

Fein, the German power-tool company, gets the credit for bringing the tool to a larger market. In 1985, the company adapted its plaster-cast saw for use in the automotive industry, where it was used to saw through auto bodies and, after being fitted with specialty blades, to remove windshields that were glued in place with silicone. Fein introduced an oscillating sander to the woodworking market a year later, but it wasn't until 1995 that the MultiMaster appeared, with all of its cutting, scraping, and sanding accessories.

Even then, Fein didn't see the potential mass appeal of the tool until about 2004, when it decided to market the MultiMaster to DIYers in a TV infomercial. It was an odd choice, promoting the high-end result of German engineering alongside the likes of the George Foreman Grill and Chuck Norris's Total Gym, but it worked. The tool took hold. And when Fein's patent ran out in 2008, every major power-tool company started making oscillating multitools. I put off buying a multitool for a long time, convinced I didn't need one, until I borrowed a friend's MultiMaster for five minutes. I bought my own the next day. Since then, it has become my favorite tool because of how often it gets me out of trouble.

Until recently, I would have said there isn't much to know about using a multitool. But last summer, I was repairing some rotten trim on a 200-year-old house. For whatever reason, one day I mounted the blade at a right angle to the tool's body for the first time. (I guess I'm not the sharpest chisel in the roll.) I knew the MultiMaster had a star-shaped arbor for a reason. But year after year, I kept mounting the blades straight ahead like barber clippers. As it turns out, you have a lot more control on plunge cuts with the blade at a right angle. Well, duh! It made me

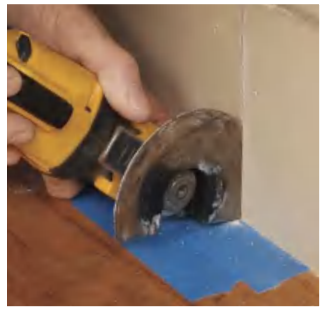
Process photos: Patrick McCombe. Product photos: Rodney Diaz.

COMMON CARPENTRY TASKS

Multitools are great for cutting molding, siding, and trim in place. You'll get the best-looking, straightest cut if you use a block of wood to guide the blade and establish the cut. To prevent overheating the blade, which causes dulling, take a shallow pass the full width of the cut, then gradually work your way back and forth. For vertical cuts, start at the bottom of the cut so the sawdust can fall from the kerf. Trapped sawdust increases friction, which accelerates blade wear.

GUIDE BLOCKS for precision cuts

A scrap of wood temporarily screwed next to the cutline guides the blade for the straightest cut. If the wood scrap interferes with the cut, remove it once the cutline is fully established.



CUT CORNERS

With a straight blade, it's easy to damage adjacent surfaces (such as finished flooring) when finishing a cut. A semicircular blade, with the flat side down, is better. Painter's tape provides extra protection.

ANGLED BLOCKS for weather cuts

Make scarf joints when patching corner boards and trim that could collect water. Establish the cut with a 3-in. or 4-in. semicircular blade. Remove the blade from the kerf frequently to clear sawdust.

GO DEEP

Once you've established the kerf with a semicircular blade, switch to a straight blade, which cuts deeper and costs less. Keep blades cool or swap them often for efficient cutting. For cutting trim in place, use fine-tooth blades.

TOOLBOX

Must-have blades

Available from most multitool-blade manufacturers, blades like these are indispensable for general carpentry and remodeling tasks. The prices are for individual blades, but you can often save a little money by buying multipacks.

Fine tooth, 1¼ in. wide, plunge cutting: $11 to $15

Aggressive tooth, 1⅜ in. wide, plunge cutting: $13 to $21

Fine tooth, 4 in., semicircular, flush cutting: $14 to $20

Fine tooth, 3⅛ in., semicircular, straight cutting: $20 to $24

wonder what else I didn't know about this seemingly simple little tool.

Don't use a multitool when another tool will work better

Multitools aren't designed to be used all day, every day. They are best suited for delicate detail work and for finishing what other, bigger tools have started. For example, Gary Striegler, a trim carpenter in Fayetteville, Ark., uses his multitool to sand handrail connections, where the profile of the fitting and the straight rail don't quite match. But he uses the multitool only on the sides, which are hard to sand any other way. On top of the rail, he's quick to reach for his random-orbit sander because it's much faster.

Likewise, when cutting wood, only use a multitool because no other saw will work. If you've got room to plunge-cut flooring with your circular saw, crosscut a header with your reciprocating saw, or cut a foundation bolt with a grinder, you're better off doing so. The work will go more quickly than with a multitool, and you'll spend less money on blades. In fact, I think it's a mistake to make crosscuts with the multitool when patching hardwood flooring. With a guide block screwed to the piece you're replacing, a properly adjusted biscuit joiner will do a faster, neater job. You can then finish the cut with the multitool. And despite the promotional photos that show multitools cutting copper pipe, a tubing cutter works better. It's fast and makes a clean, square cut. If space is tight, use a mini tubing cutter. If that doesn't work, then you can use your multitool.

Use the right blade

"The blades are too expensive, and they don't last." That's the chief complaint made about multitool blades. And even though prices have come down in recent years, the typical multitool blade still costs more than the one on your circular saw—the one that's been on there for a year and still cuts fine.

According to Richard Tiza, a product-training specialist at Fein, "People tend to use whatever blade is on the tool regardless of what they're cutting." In other words, we buy blades made of high-carbon steel (HCS) because they're cheap. Then we hit a nail, ruin the blade, and complain that the blades don't last. If you think you might hit a nail, use a bimetal blade.

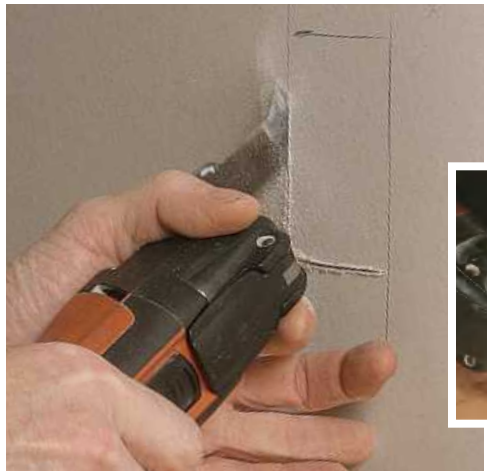
A few other points are worth noting. The smaller the teeth and the narrower the blade,

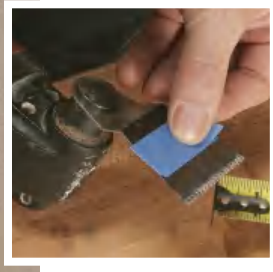
MORE THAN MOLDING AND TRIM

A multitool is the perfect tool for cutting siding, paneling, and molding in place; with the right technique, you can use it to cut PVC trim as well. It also makes an excellent labor-saving scraper. And it's perfect for making cuts in drywall when there's a risk of hitting a pipe or nicking a wire inside the wall.

LUBRICATE PVC CUTS Cutting through cellular-PVC trim can be slow with a multitool because heat generated from the oscillating blade melts the plastic, which gums up the teeth. An occasional spritz of water in the kerf keeps the teeth cutting efficiently.

RESTORE SASH SAFELY Scraping and reglazing a window's worth of glass lites is one of the more onerous jobs undertaken by pros and DIYers alike. You can speed up this tedious, time-consuming task with a multitool and a scraper blade.





MAKE SAFE CUTS IN DRYWALL Since the blade on a multitool is shorter than that on a reciprocating saw or a drywall saw, there's less risk of damaging pipes and wires that may be behind your planned cut. A piece of tape on the blade can help you gauge the depth of cut.

TOOLBOX

Specialty blades for special jobs

Special-purpose multitool blades and accessories are available for many tasks. Order them online before you need them, because it's unlikely that you'll find them at the local lumberyard.

Grout removal: $17
rockwelltools.com

Cardboard, insulation, and rubber cutting: $20
imperialblades.com

Flexible-material cutting: $8
dremel.com

Mini cut-and-file set: $32
feinus.com

the more control you have over the cut. Wider, longer blades vibrate more. Also, the wide blades with the Japanese-style teeth cut the most aggressively, but they're better for softwoods. In hardwoods, the teeth tend to break. Finally, it's worth saving dull blades; often they'll work fine for cutting drywall.

Clear away sawdust

Multitools are easy to use, and their oscillating action makes them less likely than other saws to pull or kick back. Perhaps the single most important thing to know about using one is that the blades don't eject sawdust from the kerf effectively, if at all. When sawdust builds up in the kerf, friction increases, blades heat up, and wood starts burning. Of course, the typical response is to push harder on the tool, exacerbating the problem.

If the motor bogs down, back off on the pressure. It's important to keep the RPMs high, and according to Russ Bransford at Imperial Blades, you want to keep the blade moving "like an iron on clothes." When plunge cutting, Bransford says, "rock the blade slightly, and lift it up and down in the cut. The rocking allows the chips to come out of the cut, so you end up making a faster cut with less heat buildup in the blade." Striegler echoes that advice. "Try to give the sawdust someplace to go," he says. "For instance, on a vertical cut, start at the bottom."

Ensure square cuts with guide blocks

When making cuts in existing finish materials—for instance, slicing out a section of baseboard for a built-in cabinet, use a guide block to make sure your cut is straight and square. Attach the block to the piece you're removing whenever possible so that the screw holes or nail holes are a nonissue.

You can also use a square or a straightedge to guide cuts. When you're making precise finish cuts, mount the blade at a right angle to the handle so you can brace your hands on the adjacent surface for more control. Finally, establish the kerf all the way across the face of the material before trying to cut deeply into the wood. The kerf serves as a guide and helps make a cleaner cut.

Slow down when sanding

At top speed, multitools generate more heat, which tends to clog sandpaper with paint, varnish, or simply the resins in the wood. If your multitool is set up for dust collection, use it when sanding, not only for health and easier cleanup, but because the sandpaper will last much longer. Also, don't concentrate pressure on the pad's triangular point. Doing so can generate so much heat that it melts the hook-and-loop fasteners holding the paper to the pad. Instead, keep the pad flat to the work, which dissipates the heat.

Finally, keep in mind that because of its oscillating action, a multitool leaves more scratches than a random-orbit sander does. For that reason, it's important to work through the various sanding grits from coarse to fine.

Use it for stuff other than wood

"The best thing since sliced bread." That's what tilesetter David Smith of Rogers, Ark., says about using a multitool for removing grout. He likes Imperial's boot-shaped carbide blades for grout removal. Also, a multitool fitted with a grout blade will remove thinset that has oozed up between the tiles before grouting, although it's still better to avoid that squeeze-out in the first place or to clean it out before it hardens.

Jeff Longo of Marbledale Plumbing in New Milford, Conn., says, "I use my Multi Master to make nice, neat holes in drywall when doing shower-valve replacements." A multitool makes less mess than a drywall saw, especially if you make the cut, like Longo, with a vacuum hose in the other hand.

A multitool's lack of vibration makes it the best choice for cutouts in plaster walls for things like a new outlet or a medicine cabinet. I've had good luck cutting through the plaster with a grout blade and then switching to a wood-cutting blade for the lath.

Isaak Mester, a carpenter who specializes in kitchens and baths, calls his MultiMaster the perfect tool for separating an undermount sink from a granite counter. "A stiff scraper blade cuts right through the silicone," he says.

I said earlier that you shouldn't use a multitool when another tool will work better, but there are also times you may not be thinking of the multitool when it's the best way to get you out of a jam. With the right blade, a multitool cuts through carpet, window glazing, asphalt shingles, rigid foam, aluminum flashing, and a lot more. If the right blade isn't hanging on the wall at your local lumberyard or big-box store, go online for a much more exotic selection. □

Kevin Ireton, an editor at large, is a carpenter and writer in New Milford, Conn.

project gallery

HIGHLIGHTS FROM FINEHOMEBUILDING.COM

The Ranchero

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More or less a glass box. *The extensive use of glass allows abundant natural light to enter the house and provides expansive views of the valley. The outdoor patio adds another 800 sq. ft. of covered space for relaxing and entertaining.*

Located in a subalpine meadow in Washington State's Methow Valley, this 1600-sq.-ft. house was designed by architect Tim Hammer. A four-season vacation home for an active Seattle family, it's energy efficient, environmentally and aesthetically suited to the area, and almost maintenance-free. The main building includes an open kitchen, a dining and living room that opens to a large covered patio, and three bedrooms, two baths, a small office, and a laundry room. Perpendicular to the living-room corner of the main building, a smaller building houses a ski-wax room, a sauna and shower, and a woodshed. A covered walkway links the two structures.

Hammer wrapped most of the house with a concrete skirt to protect it from heavy snow accumulation in winter (average annual snowfall is 120 in.) and water damage from spring thaws. The concrete is complemented by a simple material palette: walls of highly durable, low-maintenance Corten-steel siding, and aluminum-clad windows and doors. To

Double dining duty. *When the weather warms up and it's time for alfresco dining, the family moves the dining-room table and benches outdoors. Designed by the architect, the homeowners, and craftsman Joe Burmeister, the table has wagonlike wheels in the center and folding legs at each end. This allows it to be moved like a wheelbarrow to the patio.*

help shed snow and rain, the roof slopes from a height of 13 ft. at the outer edge of the covered patio to 10 ft. on the south side of the house. Steel columns installed both inside and outside the house support the roof during heavy snowfalls.

The interior features regionally crafted finish details. The bright white ceilings throughout are low-maintenance aluminum panels, and the floors are troweled concrete treated with a polyurethane sealant. To accommodate the homeowners' request for no paint, Hammer used integrally colored fiber-cement panels on the interior walls. In the kitchen and entry area, these panels were clad with black hot-rolled steel. Cabinetry and casework is clear fir. In the kitchen, Hammer topped the custom cabinets with Richlite Black Diamond composite counters.

Clean lines, practical design. *Sliding doors on the dining-area side of the island allow items to be accessed from either side. The stainless-steel European-style wall-mounted range hood by Vent-A-Hood and the 24-in. energy- and space-efficient Liebherr refrigerator/freezer compliment the black-steel walls. A rectangle of black steel was bent to create a storage shelf above the bench in the entry.*

Light and bright. *White aluminum ceiling panels unify the interior and help to brighten the home with reflected sunlight. For ambience and a secondary heat source, the woodstove can pivot to face either the living area or the dining area. The primary source of heat is radiant tubing installed in the concrete floor.*

Architect Tim Hammer, CAST Architecture, Seattle, castarchitecture.com
Contractor Phil Dietz, Lost River Construction, Winthrop, Wash.; lostriverconstruction.com
Structural engineering Stoney Point Engineering, Bellevue, Wash.; stoneypointengineering.com
Dining table and benches Joe Burmeister, Burmeister Studios, Seattle, burmeisterstudios.com
Photographs Stefan Hampden, courtesy of CAST Architecture

Q+A

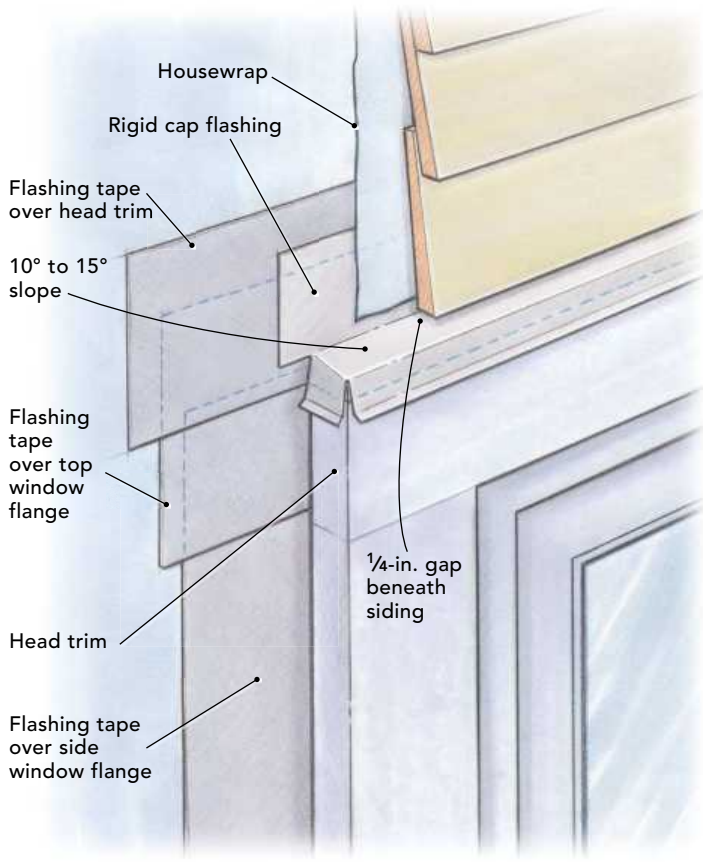
YOUR QUESTIONS—PRO ANSWERS

Watertight window flashing

Q When installing new windows, I believe it is considered good practice to allow the head flashing above the window trim to overhang a little bit on each side. This leads to an awkward condition, though, where water could pour behind the siding if it's improperly sealed. Should head flashing have an end dam?

—BRIAN KUHN
Prairie Village, Kan.

A *Editorial adviser Mike Guertin replies:* End dams are considered best practice, and some premium prefab cap flashings include end-dam elements. That said, however, I don't think that they're absolutely necessary. Cap flashings should have a slope between 10° and 15° so that water will drain off the front of the flashing rather than toward its ends. Before adding a rigid cap flashing, I provide extra protection by applying a strip of flashing tape wide enough to extend at least 3 in. beyond the trim on each side of the window. The tape extends above the point where the head flashing terminates and laps over the top of the head trim. This way, any water that bypasses the cap flashing and gets in on either side of the window will drain against the flashing tape.



Can radon mitigation work with interior perimeter drains?

Q In finishing my basement, I want to implement techniques for thermal and moisture management that have been illustrated in *Fine Homebuilding*. For instance, I plan to add an interior perimeter drain and to cover the walls and floor with cross-laminated polyethylene sheathing and insulation before framing new walls. My slab is in reasonable shape, but it's by no means free of cracks and holes. My question is with regard to radon. I've read that for a mitigation system to be effective, the slab needs to be continuous so that the system's inline fan can create a vacuum below the slab. What's the best way to incorporate a mitigation system in a basement with an interior perimeter drain? Can I integrate the mitigation system into my new floor assembly?

—ROB YAGID
Collinsville, Conn.

A *Senior editor Martin Holladay replies:* You can integrate a radon-mitigation system with your basement floor, but the details might be tricky. The two systems you describe—an interior drainage system designed to collect liquid water and a radon-mitigation system designed to collect and remove radon gas—aren't completely compatible, so compromises and special details are required to make sure that both work.

For your drainage system to work, the perforated pipe

Drawing: Dan Thornton

needs to convey water either to daylight or to a sump. If the system has a sump, you will need a sump pump with a discharge pipe.

To make a radon-mitigation system work, your foundation walls and your slab must be as airtight as possible. Radon-mitigation systems depressurize the subslab region, and these systems will not work if there are significant air pathways that connect your subslab region either to the outdoor air or to the indoor air that's in your basement.

For a radon-mitigation system to work with a perimeter-drain system, be mindful of the following details.

- If the perforated pipe drains to daylight, it's essential to install a check valve at the termination point of the drain.
- If the perforated pipe drains to a sump, the sump must have an airtight lid. Moreover, the discharge pipe connected to the sump pump must include a check valve.
- If the foundation walls are made of CMUs (concrete masonry units), or concrete blocks as they're often called, there must not be any drainage holes in the block walls.
- Most French drains are installed in a trench filled with crushed stone. This trench must be capped with concrete; the crushed stone must not be left exposed.
- As part of the commissioning process, it's important to make sure that the radon-mitigation fan isn't depressurizing your basement. Basement depressurization can cause atmospherically vented appliances such as water heaters or furnaces to backdraft, and it can also lead to condensation and mold problems during the summer.

If your home needs a radon-mitigation system, the best approach is to hire a radon-mitigation contractor who has been certified by the American Association of Radon Scientists and Technologists (AARST).

One fan or two?

Q I have an existing dwelling with two bathrooms on the upper level. These bathrooms share a wall, and the previous owner installed a single fan in each that exhausts into the attic. I know how that can lead to moisture problems in the attic, and I want to vent the bathrooms out the roof. Is it preferable to install a single, remotely located exhaust fan with an inlet duct in each bathroom and a single exhaust through the roof, or to duct each of the two existing fans to discharge separately?

—TED OLMERT
Burlington County, N.J.

A *Editorial adviser Mike Guertin replies:* Either option would work fine. You might choose a remote fan if you have a tight house and plan to use the fan for continuous ventilation. Also, remote fans can be quieter than individual fans. Finally, with one remote fan, there would be only one exhaust hood on the roof, which is both easier to install than two hoods and would reduce the number of roof penetrations.

On the other hand, separate fans draw air only from the bathroom that requires ventilation (although efi.org offers a damper to prevent this problem with remote fans connected to two bathrooms). In your case, keeping the existing fans might mean less work and less expense since the only thing to do is install new exhaust ports through the roof. Going with a single fan would require you to remove the existing fans, patch and repaint the ceilings, and add new inlet grates. Of course, if the current fans aren't high quality, they may not work well or may be noisy, in which case you may consider buying and installing new fans.

A QUESTION FROM Green Building Advisor.com

Encapsulating framing in spray foam

Q Is it safe to coat framing fully in spray foam? I recently had the underside of my roof deck insulated with closed-cell polyurethane foam. In order to meet code here in northern Canada, the crew needed to install 4 in. of foam to get to the required insulating value. This much foam fully encapsulated the 2x4 top chords of each roof truss. I'm worried that these 2x4s are going to rot because they cannot breathe. Is it problematic to encapsulate wooden framing components in foam?

—MARK HELMRICH

A *Engineer Joe Lstiburek, principal at Building Science Corp. in Westford, Mass., replies:* It is not a problem to fully encapsulate framing members with high-density closed-cell foam, regardless of your climate. Note that the wood roof deck itself is, more or less, fully sealed with foam, yet there is still some downward drying into the attic and upward drying through the shingles and roof underlayment, even in a severely cold place where they play hockey outside in June. It's true that the thicker the layer of foam, the lower the potential for inward drying, but that thicker foam also means there's a lower potential for upward wetting, so it's less likely to see moisture in the first place. Likewise, a thinner layer of foam, such as what you have covering the edges of your truss chords, has a greater potential for upward wetting, but there's also a higher potential for inward drying. Simply put, the thickness of the foam layer over the framing members does not matter much one way or the other.

BY MARTIN HOLLADAY

Adding insulation to basement walls

If you live in South Carolina, Alabama, Oklahoma, Southern California, or anywhere colder, your basement walls should be insulated. In climate zones 3 and higher, basement insulation is required by the 2012 International Residential Code as follows: R-5 in climate zone 3, R-10 in climate zone 4 (except marine zone 4), and R-15 in marine zone 4 and climate zones 5, 6, 7, and 8.

If your home lacks basement-wall insulation, it's much easier to install interior insulation than exterior insulation. Here's how to do it correctly.

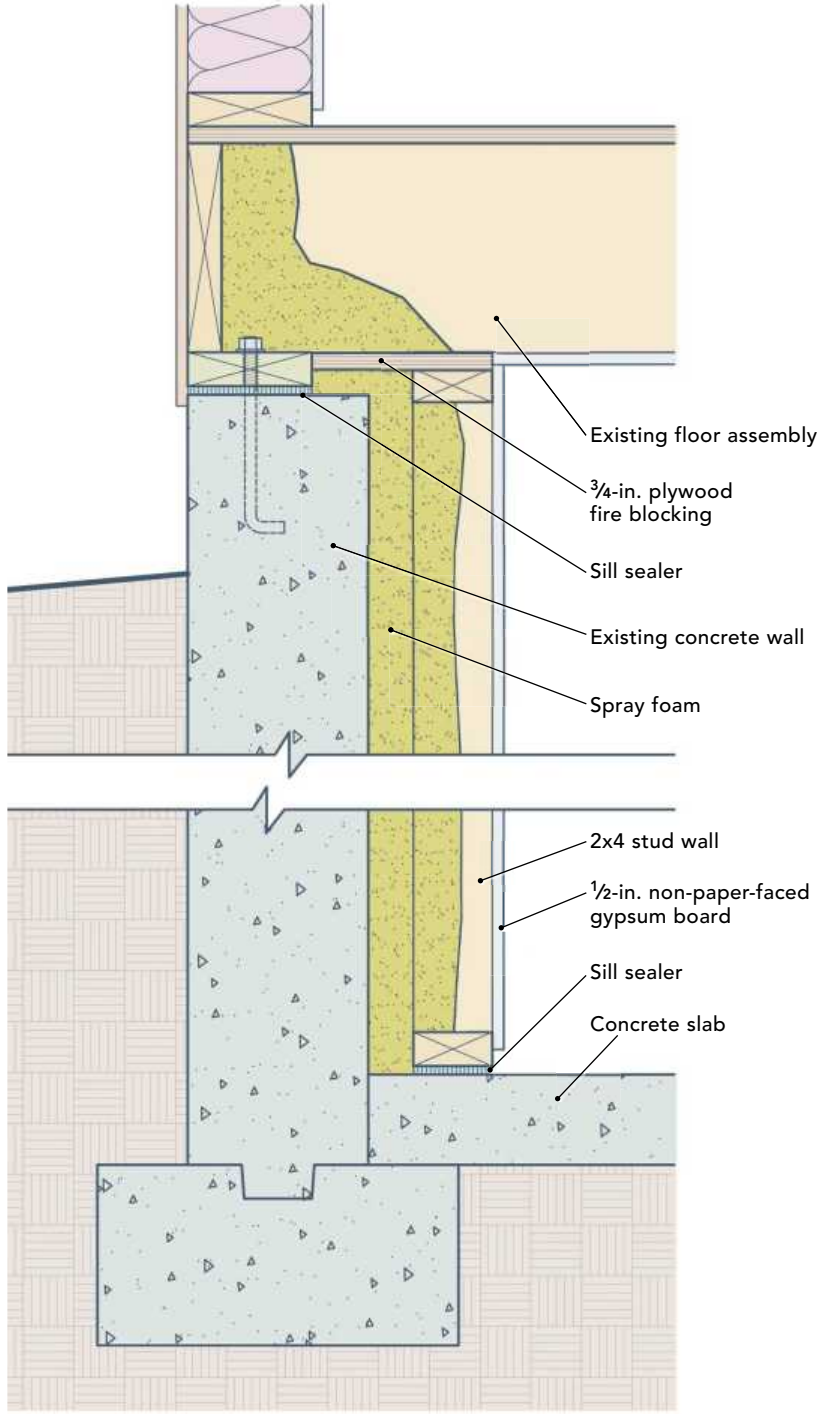
Make sure your basement is dry

Before installing any interior-wall insulation, verify that your basement doesn't have a water-entry problem. Diagnosing and fixing water-entry problems in existing basements is too big a topic to be discussed here (but see "Build a Risk-Free Finished Basement," *FHB* #248). Suffice it to say that if your basement walls get wet every spring or every time you get a heavy rain, the walls should not be insulated until the water-entry problem is solved.

Use foam insulation

The best way to insulate the interior side of a basement wall is with foam insulation that is adhered to or sprayed directly on the concrete. Any of the following insulation materials are acceptable for this purpose: closed-cell spray polyurethane foam or either XPS, EPS, or polyisocyanurate rigid foam.

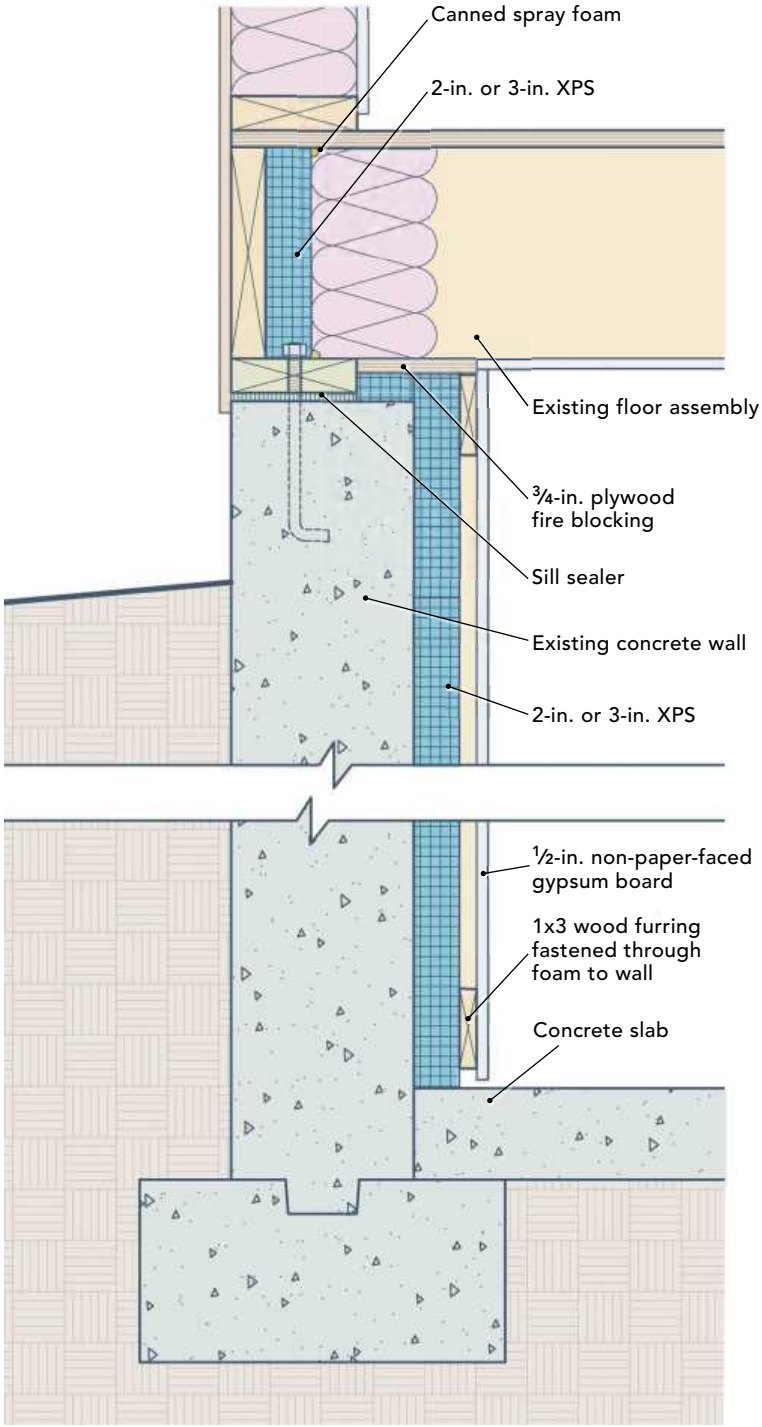
Rigid foam can be adhered to a poured-concrete or concrete-block wall with foam-compatible adhesive or with special plastic fasteners such as Hilti IDPs or Rodenhouse Plasti-Grip PMFs. To prevent interior air from reaching the cold concrete, seal the perimeter of each piece of rigid foam with adhesive, caulk, high-quality flashing tape, or canned spray foam.



CLOSED-CELL FOAM

If you want to insulate the interior of your basement wall with spray foam, specify closed-cell spray foam, not open-cell foam. Closed-cell foam does a better job of stopping the diffusion of moisture from the damp concrete to the interior. Frame the 2x4 wall before the spray foam is installed, with a gap of about 2 in. between the 2x4s and the concrete.

Drawings: Steve Baczek, Architect



RIGID FOAM

A 2-in. layer of XPS foam (R-10) is adequate in most of climate zone 4. However, if you live in marine zone 4 or in zones 5, 6, 7, or 8, you need at least 3 in. of XPS or 4 in. of EPS to meet the minimum code requirement of R-15. Furring strips should be fastened to the concrete wall through the rigid foam.

Building codes require most types of foam insulation to be protected by a layer of gypsum drywall. Many builders put up a 2x4 wall on the interior side of the foam insulation; the studs provide a convenient wiring chase and make drywall installation simple. (If you frame a 2x4 wall, don't forget to install fire blocking at the top of the wall.)

If your basement has stone-and-mortar walls, you can't insulate them with rigid foam. The only type of insulation that makes sense for stone-and-mortar walls is closed-cell spray polyurethane foam.

If you plan to insulate your basement walls with spray foam, the best approach is to frame your 2x4 walls before the foam is sprayed, leaving a gap of 1½ in. to 2 in. between the back of the studs and the concrete wall. The gap will be filled later with spray foam.

If you live in an area where termites are a problem, your local building code may require that you leave a 3-in.-high termite-inspection strip of bare concrete near the top of your basement wall.

While reduced costs might tempt you to use fibrous insulation such as fiberglass batts, mineral-wool batts, or cellulose, these materials are air permeable and should never be installed against a below-grade concrete wall. When this type of insulation is installed in contact with concrete, moisture in the interior air can condense against the cold concrete surface, potentially leading to mold and rot.

Don't worry about inward drying

Some people mistakenly believe that a damp concrete wall should be able to dry toward the interior—in other words, that any insulation on the interior of a basement wall should be vapor permeable. In fact, you don't want to encourage any moisture to enter your home by this route. Don't worry about your concrete wall; it can stay damp for a century without suffering any problems or deterioration.

Avoid polyethylene vapor barriers

Basement wall systems should never include polyethylene. You don't need any poly between the concrete and the foam insulation, nor do you want poly between gypsum drywall and the insulation. If your wall assembly includes studs or furring strips, polyethylene can trap moisture, leading to mold or rot.

Basement insulation is cost-effective

If you live in climate zone 3 or anywhere colder, installing basement-wall insulation will almost always save you money through lower energy bills. It will also provide an important side benefit: Insulated walls are less susceptible to condensation and mold. This means that insulated basements stay drier and smell better than uninsulated basements.

Martin Holladay is a senior editor.

BY ANDY ENGEL

Replacing a floorboard

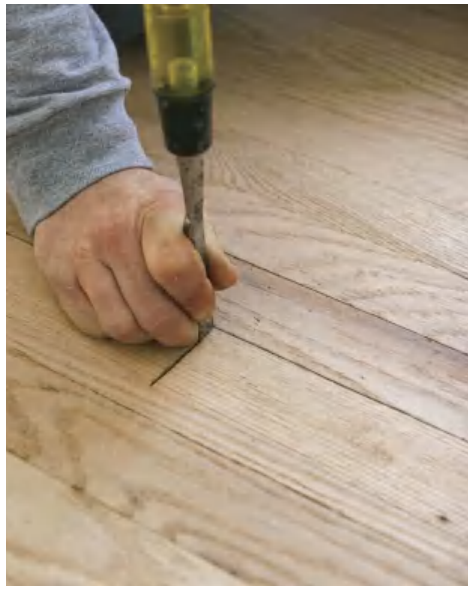
Although the tongue-and-groove joints that unite the boards in a wood floor may seem to preclude replacing just one board, the process is pretty straightforward. Since the board to be replaced is toast anyway, removing it piecemeal makes that part of the process simple. Then it's a matter of removing the lip that forms the bottom of the replacement board's groove so it will fit over the tongue of the existing flooring. The new board is then fit in place and secured with glue. This type of repair is usually part of a floor-refinishing project because the new board has to be sanded even with the surrounding boards and finished to match.

You might think that finding a replacement board would simply entail visiting a lumberyard and buying one. It's rarely that simple, though. Even common ¾-in. by 2¼-in. red oak is sold in 20-sq.-ft. bundles for about $2 per sq. ft. If your flooring is anything other than 2¼-in. red oak, you'll probably have to buy it from a specialty supplier or have a piece milled.

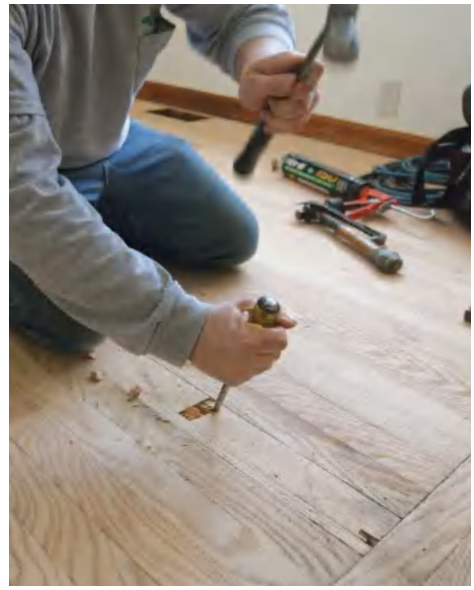
If you're lucky, though, you may have a solution at hand. The original builder may have left a few pieces of flooring up in the attic. It's worth a look, but if you aren't that lucky, don't give up. Odds are you can carefully remove a piece from inside a closet. Choose one from the edge so that you can get it out without having to split it in half, then replace it with whatever flooring you can scrounge or make.

Andy Engel is a senior editor. Photos by Justin Fink.

STEP BY STEP

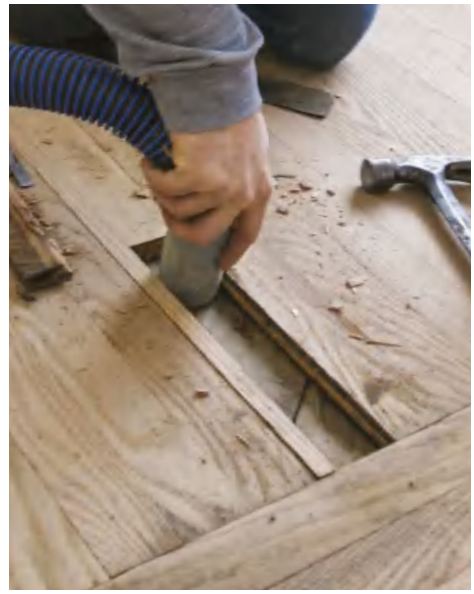


1 ***Cut long boards.*** *Remove a damaged short board entirely. With longer boards, it's less work just to remove 1 ft. or so of a bad section. Mark a square line across the board, and chisel a series of cuts about ¼ in. into the board.*



2 ***Chop out the waste.*** *Chiseling the damaged board toward the initial square cut, remove ¼ in. of wood at a time. Repeat these first two steps until you've cut all the way through the board. You also can make the cut with a multitool.*

3 ***Split the bad board.*** *Drive in the chisel parallel to the grain in several places. When the board splits, lever out the chunks with the chisel.*



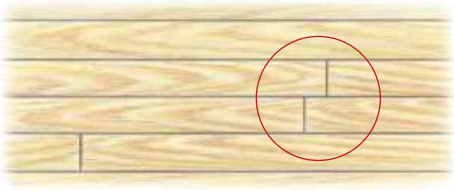
4 ***Vacuum out the debris.*** *If there's a layer of tar paper or rosin paper below the flooring, remove it to expose the subfloor before vacuuming up wood debris.*

STEP BY STEP

Watch where you make that cut

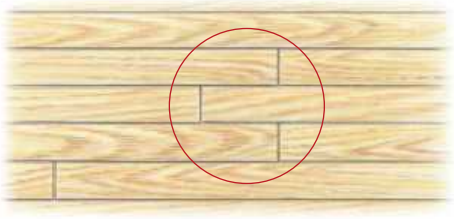
Careful installers pay attention to where they place the joints in a floor. A few things to avoid are butt joints closer than 6 in. to each other, evenly spaced joints that resemble stair steps, and patterns where three joints in consecutive rows resemble the letter H. When replacing a board, be careful to avoid creating one of these situations. A good rule of thumb is to not have any joints that are closer than the width of a floorboard over three neighboring courses.

Spacing flaws



Closely spaced joints

Staircasing



H-pattern

5 ***Break the bottom of the groove.*** *Lay the replacement board on a clean section of floor, and use a hammer to break the bottom lip that forms the groove.*

6 ***Remove the bottom lip.*** *Clean up the broken edge with a knife or plane to ensure that the new board fits over the tongue of the abutting flooring.*

7 ***Construction adhesive seals the deal.*** *Put two beads of adhesive on the subfloor, and another along the tongue of the abutting board. Leave the other edge unglued to allow for seasonal movement.*

8 ***Slip in the replacement board.*** *Engage the replacement board's tongue with the abutting groove, and push the groove edge down.*

9 ***Tap it home.*** *Strike the replacement board with a heavy hammer, being sure that the hammer face hits squarely to minimize marring. If the board doesn't seat well, drive a couple of 6d finish nails into it to hold it down.*

Drawings: Dan Thornton

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Taunton

BY BUD DIETRICH

Well-proportioned trim

Interior trim is such an important element of a room's design that it deserves more than just a few seconds' thought, yet that's often all it gets. In particular, there's often little thought given to one of trim's most important aspects: its size. Many builders and homeowners head to the local lumberyard or big-box store and buy what they find without thinking through whether it's the right size or if its proportions will enhance the room. Once it's installed, they see that rather than dressing up the room, the trim they've chosen leaves the room looking flat and dull.

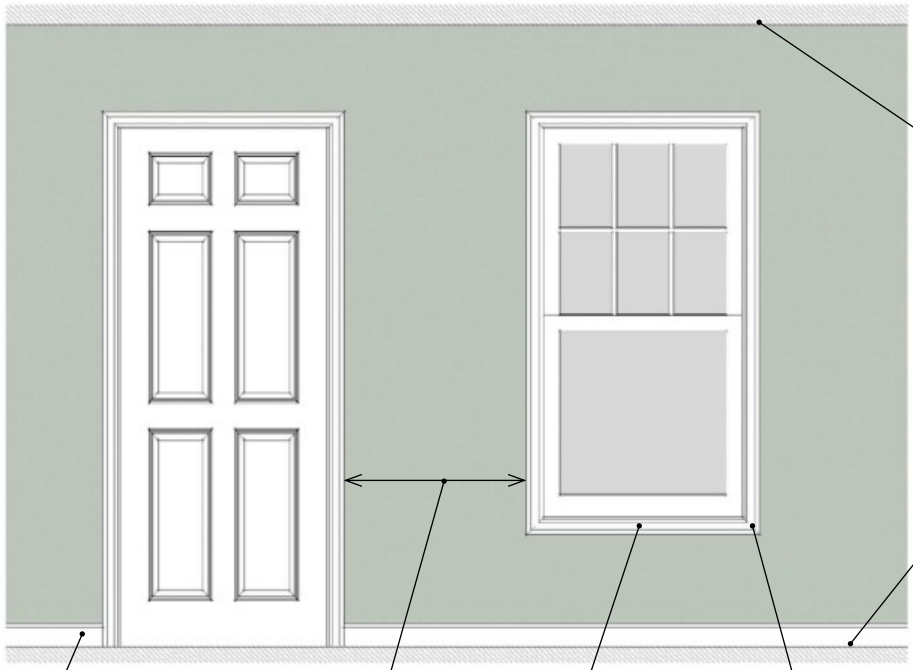
Trim started out with the utilitarian purpose of covering the gaps between walls and floors and between walls and ceilings, as well as the gaps between dissimilar materials such as plaster walls and wood window frames. It quickly evolved into an important design element. Shaped and milled in many different manners and styles, trim has become a way to enrich our experience of a room. But this can happen only when trim is proportioned properly.

The good news is that getting trim proportions right doesn't take the keen eye of an experienced designer. All it takes is consideration and use of a few time-tested guidelines. The result is a room that provides a richer experience and is more comfortable to live in.

Bud Dietrich is an architect in New Port Richey, Fla.

POORLY PROPORTIONED TRIM

Sometimes referred to as "builder's standard," this trim package offers just the basics. With 3¼-in. base and 2¼-in. casing, this is the trim most readily found at big-box retailers. There is no crown molding, and window casing is typically installed in a picture-frame manner. Trim of this size is usually overwhelmed by the room's other architectural features and appears visually off. With no unifying elements, door and window openings appear as stand-alone features rather than parts of a whole, making the space appear flat and cartoonish.



Without crown molding, the transition between wall and ceiling is abrupt. This tends to flatten out the room because there's no visual bridge to connect the vertical wall plane with the horizontal ceiling plane.

Without a shoe molding, gaps between the baseboard and floor are revealed, making the room look unfinished.

The 3¼-in. baseboard isn't tall enough to provide a strong foundation to the room. Baseboard height should be about 7.5% to 8.5% of the wall's height.

With no connective trim to bind the architectural elements together, each exists on its own and does not contribute to the whole.

At 2¼ in., the casing width is too close to the baseboard height. This dimensional similarity blurs the distinction between the horizontal base and the vertical casing, creating visual monotony.

Wrapping the casing around the window in a picture-frame manner flattens out the trim, reinforcing the two-dimensional quality of the room.

Drawings: Bud Dietrich

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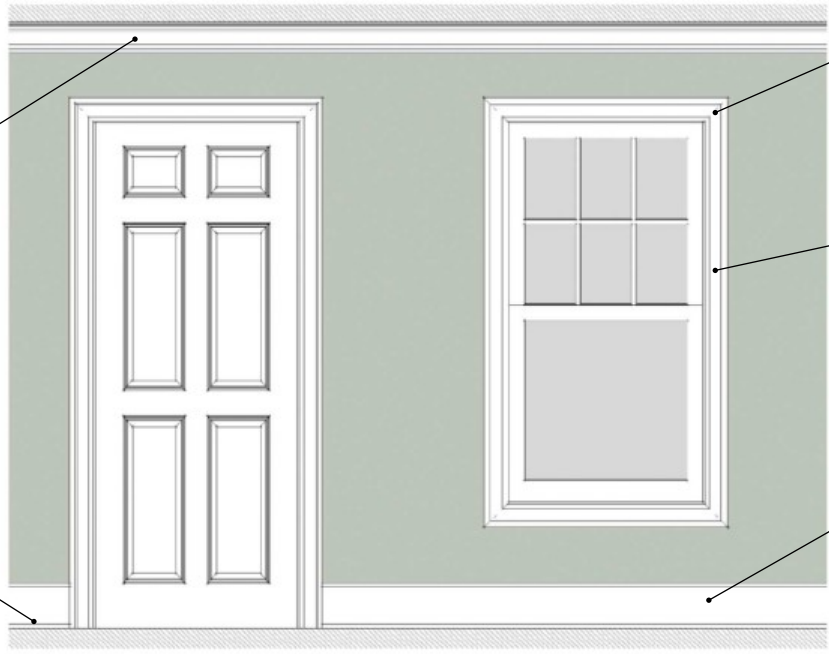
PROPERLY PROPORTIONED TRIM

Simply increasing the size of the trim yields dramatic results. A 7½-in. base, 3¼-in. casing, and 3½-in. crown molding create a more interesting room, with the crown and shoe molding easing transitions from ceiling to wall and from wall to floor. Even with the window casing installed in a picture-frame manner, this larger, better-proportioned trim results in a more tailored look. This trim package costs more than the builder's standard, but it's readily available at most lumberyards and shouldn't break the bank.



Crown provides a transition between wall and ceiling, connecting the two elements into a whole. Two rules of thumb can apply here: Use crown that's at least as tall as the casing is wide, or use crown that is about ½ in. tall for each foot of ceiling height. You'll have to gauge this with specific moldings, because each will project into the room differently.

Shoe molding eases the transition between wall and floor and provides a tailored, finished look.

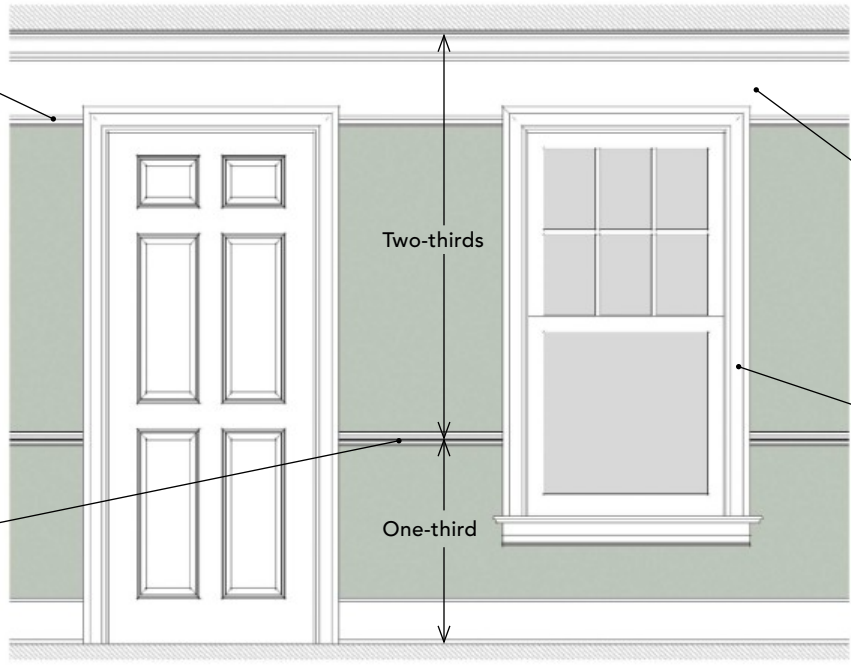
The window casing is still installed in a picture-frame manner, but the larger dimension yields a more robust visual element.

The 3¼-in.-wide casing is about half the height of the baseboard, visually differentiating the two. This contrast emphasizes the casing's narrowness, and we tend to respond favorably to vertical elements that are not overly wide.

The 7½-in.-tall baseboard is about 8% of the height of an 8-ft.-high room. Like cuffed pant legs, this taller baseboard provides a strong base, anchoring the wall to the floor.

BEYOND THE BASIC TRIM PACKAGE

In this drawing, two strong horizontal trim elements—a picture rail and a chair rail—have been added to the room with well-proportioned base, casing, and crown. These horizontal elements unify all of the walls of the room, binding them together like the ribbon that wraps a gift. In addition, the window casing now includes a stool and an apron.



Depending on the height of the ceiling and the size of the crown, a picture rail can be placed above the windows, at the top of the windows, or slightly below the top, as pictured here. The key is to place it high enough that it engages with the crown, but not so high that it crowds the crown.

A chair rail splits the wall into sections. The rule of thumb is to set the chair rail at one-third of the wall height. For an 8-ft. (96-in.) ceiling, the chair rail would be 32 in. above the floor.

Space between the crown molding and the picture rail is painted the same color as the ceiling to visually lower the ceiling and create a more intimate room.

Rather than a simple picture-frame installation, the window trim incorporates a 3¼-in. apron and a stool that projects about an inch beyond the casing. This provides a strong base for the window and a more three-dimensional character to the trim.

PRODUCT SHOWCASE

tailgate

INTERVIEW BY AARON FAGAN

COLBY M. BROADWATER III, College President This retired army officer now leads the American College of the Building Arts, which trains the next generations of craftspeople.

I find the presence of a school like yours encouraging. How did it begin?

After Hurricane Hugo slammed into Charleston, S.C., in 1989, qualified artisans to work on the city's historic structures were not available. City leaders and others were determined to do something, and that's what led to this college. The skilled workers in this country are aging, and no one is replacing them.

If you go back two or three hundred years, the guild houses of the various trades were some of the finest buildings around. A hundred years ago, mass production and assembly lines took the glamour off that.

Our point of view is that some of that glamour needs to be restored. We all appreciate the beauty and long-lasting quality of fine old homes and craftsmanship, but if we don't have a new generation of skilled artisans producing that work, there won't be anything left to appreciate in the future. We're trying to do our small part to ensure that the skills learned over thousands of years are maintained so that we can continue to build to those standards for people who demand it.

How have you engaged your community?

The iconic Charleston ironworker of the 20th century was a gentleman named Philip Simmons. Years ago, he wondered who would be there to repair his ironwork. In the early 1960s, he made the Christopher Gadsden House gate, which features a distinctive rattlesnake detail that was inspired by Gadsden's design of the "Don't Tread on Me" flag from the American Revolution. Our students are now restoring that gate, and it's fitting that Simmons played a part in forming our school.

What's the curriculum like?

Our students—about 50 at present—all have the same academic curriculum, and they major in one of six areas of building arts: ornamental ironwork, timber framing, carpentry, plasterwork, masonry, and stone carving. They study the hands-on skill for four years, which includes three summer internships that give them exposure to the business side of being a working craftsperson. This blending of an academic degree with the skills learned in the shops and laboratories brings their education to life.

Not only do students learn the art of preservation and construction, but they also learn the science of it. When they master both, they come out of here not only knowing what solution is appropriate for a particular building challenge and why, but also how to implement it.

> **If we don't have a new generation of skilled artisans producing quality work, there won't be anything left to appreciate in the future.**

The Compagnon system in France, which dates back to the Middle Ages, helped us develop the hands-on approach we use. It gave us a historically grounded way to meet the challenges of today. Its techniques are as applicable to new construction as they are to preservation.

Describe the typical ACBA student.

Our students tend to be a little bit older than the average college freshman, and they all have an artistic leaning. Some of them may not even know the full extent of that capacity, but it really comes out of them when they're here. They have a deep commitment to learn how to make something that is lasting. That is the real draw.

Do your graduates go on to become home builders?

Most of our graduates are subcontracted for timber framing or to build components that will be used in homes. Some of them are employees, and some have started their own businesses. In each discipline, they have restored historic work, and they have produced what will someday be historic work worthy of preservation.

Is there an arc to the typical student experience?

With good training, people can do just about anything. With the education and training our students get here, they motivate themselves to get better by being exposed to these classic building materials and techniques. What we try to do is give them the skills and the opportunities to do that.

We forget that the recipe for cement was lost after the fall of the Roman Empire.

People forget that at least half of those alchemists in medieval Europe, who were said to be trying to make gold, were actually trying to make porcelain—they called it white gold. Somebody's got to sustain those skills.

Recently there was a workshop here on scagliola, which involves making plaster that looks like marble. You could see these young men and women arrive at an understanding of how the marble formed through pressure and so on, and that the veining was caused by natural sediments being forced in different ways. Watching them re-create that out of plaster was amazing. It is almost a lost art.

For the complete interview, visit FineHomebuilding.com/extras.

INDEX TO ADVERTISERS

Glass in the garden

What was originally planned as a modest three-season porch evolved into this striking 36-ft. by 18-ft. four-season pavilion. Some of the 8-ft.-high floor-to-ceiling walls of glass open like French doors to the yard and have retractable electronically operated screens mounted in their headers. The timberlike columns that separate each wall of glass are actually hollow boxes to accommodate wiring for outlets, lights, and infrared heating units. The roof decking is 2x6 and 2x8 square-edge southern yellow pine reclaimed from tobacco sheds. The boards' original patina was preserved; some have their original peeling white paint, while others display milling marks that add beautiful texture. The ceiling beams are painted Douglas fir. The wood-burning fireplace is made from locally sourced stone, and the mantel is an antique hand-hewn timber. The pavilion floor is sealed Tennessee flagstone.

The pavilion's ample dining and sitting areas, relaxing daybed suspended from the ceiling, and cooking and grilling area behind the fireplace allow the homeowners to enjoy this special space day in and day out. They have earned a well-deserved reputation for throwing the best pavilion parties in town. *—Maureen Friedman*

ARCHITECT Parker Platt, Platt Architecture, Brevard, N.C.; plattarchitecture.com **GENERAL CONTRACTOR** Preish Construction, Asheville, N.C.; preish.com
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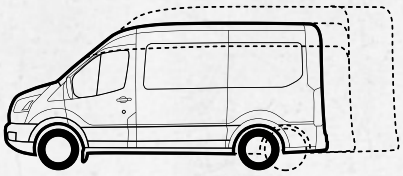

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